Flight Surgeon's NEWSLETTER

(This material is for the information of commanding officers, aerospace physiologists and psychologists and Navy flight surgeons and does not necessarily reflect endorsement by the Department of the Navy or the Naval Safety Center.)

FSNL - 1st Quarter 1969

HAPPY NEW CALENDAR YEAR!

Time trundles tenaciously toward terrible terminus....

It's not as bad as it sounds, but we have reached a self-imposed deadline for requiring all Medical Officer's Reports of Aircraft Accident (MOR) to be made on the new form. As you know, CHANGE-2 to OPNAVINST 3750.6F was effective back in August 1968 and established the requirement for a new form. However, there were difficulties in getting the thing off the presses and distributed, so we settled for reports on the old form. Now we want to begin computer coding all MORs in the new format for any accident which occurs on or after 1 January 1969. We hope that all commands have by now received a supply of OPNAV Form 3750/8A through I (Rev 4-68), but in case you haven't, we have printed them on the last pages of this issue. They may be locally reproduced in small numbers for individual accidents (as a last resort) for those who haven't a supply yet. In the meantime, contact your supply officer for assistance in procuring the forms.

You'll note from CHANGE-2 that only three copies are now required: original for the original AAR and two copies for mailing to the Naval Safety Center with the advanced AAR. The forms will come in pads with a work sheet and four copies of each page, so one typed copy and the work sheet can be retained in your unit safety files. Please make the carbon copies as legible as possible. We will be reproducing these carbon copies at the Naval Safety Center for further distribution and a fuzzy copy is hard on ol' Grandpa Medibone's eyeballs.

Our Air Force counterparts have received over 100 reports submitted on the new format, and they are highly pleased with the results. The report is easier to analyze, the data more readily encoded, and quality of data, as well as significance, is improved. Our limited experience to date concurs with these opinions, so the years of effort put forth by Captain Dick Luehrs and many others to achieve a tri-service MOR are now bearing fruit. As you gain experience with the report, we would appreciate comments and suggestions. Changes to the forms will come slowly, but all of us will be striving to continue improving the quality of injury reporting, with the constant aim of more effective accident prevention programs.

FRANK H. AUSTIN, JR., CAPT, MC, USN
Head, Life Sciences Department

AIRCREW HANDOUT: "FLIGHT SURGEON'S CORNER"
(The following aircrew handout is reprinted from MAG-56's Safety Natops Bulletin, June, 1968).

Medical Training for Aircrewmembers

Although we would not think of abandoning aeromedical training for pilots, we are frequently guilty of assuming that the same training somehow reaches enlisted aircrewmembers by osmosis. The unfortunate truth is that crewmembers often remain uninformed in this area. Many have little or no idea about what an ear block is or how to clear it, annual physicals, up-chits and down-chits, etc. OpNavInst 3710.7D and the Aircraft NATOPS Manual make clear that such training is necessary and required. Toward this end, the following medical ground rules for enlisted crewmembers have been compiled by the Flight Surgeon. These rules, locally modified as necessary, can be printed and distributed individually to every enlisted crewmember and particularly, crewmember candidates. Logical distribution points would be the NATOPS Officer, Flight Line Officer, or Medical Officer (at the time of the initial or annual flight physical). It may also be used as a handout at tech training lectures.

Medical Ground Rules for Aircrewmembers

General Health

"Aw hell, I can make it!" may be your natural reaction to minor illness, but it is an attitude dangerous to yourself and your flying mates. If you don't feel well enough to fly, don't fly! See the Flight Surgeon. Be sure to seek treatment early. Sick people who delay getting treatment usually wind up being grounded longer than those treated early in their illness.

Ear blocks and sinus blocks. Ear block = pain or fullness in the ear. Sinus block = pain or fullness behind an eye or alongside the nose. Both of these may occur during rapid descent in aircraft. They may occur in helos as well as in other aircraft, particularly during autorotations. They may occur in descents begun even at fairly low altitudes like 2000 - 3000'. What do you do if you get a block while airborne? Tell the pilot you have an ear/sinus block. If mission allows, request that the aircraft stop descent, then climb and then descend more slowly. While this is happening, close your mouth and nose and strain hard to blow and open up your ears and sinuses and do this all the way down. See your Flight Surgeon when you reach the deck. Don't fly with a stuffy cold. You are likely to get an ear block or sinus block.

Personal Protection

Protect your hearing!!! Wear ear protection (Mickey Mouse ears or ear plugs) in all noisy areas, especially (a) when within 100' of a turning up aircraft for longer than one minute, (b) under your hard hat on the gunnery portion of training gun hops, (c) in accordance with other local flight line regulations.

Give tail rotors wide berth; they're just like any other prop.

Protect your eyes. Use goggles whenever directing taxiing aircraft.

Gloves protect your hands from flash fires. Crewmembers are notorious for forgetting to wear them -- they're your hands,buddy!!

Personal Hygiene

Alcohol: Flying under the effects (drunk or just high) is dangerous, illegal and misconduct. Flying under the after-effects (hangover) is nearly as dangerous because it makes you relatively useless as a crewmember, even if you aren't all-out drunk.

Sleep: Flying with too little sleep is nearly as dangerous as with alcohol because you cannot be depended upon. Remember, an unalert crewmember is not merely useless; he is a definite safety hazard to flight.

You must keep your weight down in order to maintain flight status (and flight pay) as well as to keep physically fit.

Again, don't be a safety hazard. Preventive hygiene (like preventive maintenance) is the best doggone insurance going. A crewmember who is not in shape to fly belongs on the deck, not under it.

Vertigo

You've heard the pilots talk about this. This is when your bodily feelings ("the seat of your pants") actually lie to you about the aircraft's movement. This usually happens when IFR conditions cover up the ground and horizon. The aircraft is not really moving the way your body thinks it is. If you can see them from your station, learn to understand the gyro dials that your pilot depends upon in IFR flight.

Medical Paperwork

Up-Chits: These are blue. An up-chit is a piece of paper that says you are medically qualified to fly. You cannot fly as crewmember without it. If you do, you will be flying in violation of NATOPS. This chit cannot be issued by anyone except a Flight Surgeon. Other Medical Officers and Corpsmen cannot issue these. You must get an up-chit at the time of your first flight physical, at each annual physical thereafter and each time you check into a new squadron.

Down-Chit: This is red. It is a piece of paper that says you are not medically qualified to fly. It may be issued by any medical department personnel. You cannot fly again without first getting an up-chit from the Flight Surgeon.

Flight physical: After your initial flight physical you must get a repeat flight physical yearly. This may be a birth date physical but it does not have to be.

LT N. R. VOLOW, MC
HML-267 Flight Surgeon

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FLIGHT SURGEON'S SUMMARY

Here's an example of an exceptional summary from a Medical Officer's Report. The flight surgeon is LT William R. Davis, MC.

"Summary, Discussion, Conclusions and Recommendations

"Over-correction in close for high ball indication, excessive sink rate established, starboard wheel assembly sheared off upon touchdown. No pilot injury.

"Signs of stresses of shipboard life and five months of combat air operations were readily apparent in early July. About such things as salt water in the drinking fountains, grumbles were getting louder. About such other things as ever-present shower hours, copious 1MC announcements during sleeping hours and three square breakfasts a day during red carrier ops, the grumbles were getting louder still. Transitions also were (and remain) a problem: try keeping pace with air ops eight to eight, then noon to midnight, then midnight to noon, and so on. Actual personal adjustments involved in such transitions are vastly more difficult to make, e.g., than mimeographed changes in the air plan, and if the concept of circadian rhythms applies at all, the human organism five months at sea--operating irregular twelve or more hour schedules--may be disposed not only to impatience but to a type of mild disorientation as well.

"In certain cases, I believe, the expression 'pilot error technique/judgment' may not really say a great deal about causation and nothing about prevention. Considering contributory factors in the case in question, for example, problems associated with diet, with noise, with availability of fresh water, with length of the cruise and with schedule changes seem at least worthy of speculation. Though speculative in itself, one thing seems clear enough to this observer: In over two days the pilot accumulated 12½ hours of rack time in patches, only part of it sleep. At a critical moment in his approach he made a play for the deck, something straightaway and regretfully admitted. Taking it from the same moment in the approach, but with adequate pilot sleep, I'd place my bet on another bolter and eventual uneventful arrestment.

"As for recommendations, then, it's the same old, often operationally impossible story: sleep. Late in the cruise, general caution's also in order; and CAG's office has been working effectively on such other problems as noise abatement and nighttime meals in the wardroom."

The first endorsement to the accident report stated in part, "The physical and psychological condition of all flight and maintenance personnel is of prime concern aboard (CVA-XX). The tempo of Yankee Station operations does place additional stress and strain on all personnel; this is inherent in any combat operations; however, every effort is made to ease these problems, as noted in the Medical Officer's Report Summary."

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MEDICAL OFFICER'S ACCIDENT INVESTIGATION BAG

The medical officer's accident investigation bag described and shown here was designed principally by HMC Ray Elam and is sponsored by LCDR E. M. Jewusiak, MC, senior medical officer of NAS Willow Grove. This material was forwarded to the Safety Center by the Chief of Naval Air Reserve Training. Here are Dr. Jewusiak's comments on the bag:

"Background: The medical officer's investigative report is a very important and vital document in the study of accidents for legal and preventive reasons and should therefore be as complete and accurate as possible. In most cases information and specimens taken at the scene of the accident as soon after its occurrence as possible are the most accurate. Because accidents are never planned it was felt that a need existed for the development of a medical officer's investigation bag.

"Development: The accident investigation bag was for the most part designed by HMC Ray Elam, USNR-R(TAR) and was fabricated with the willing and able assistance of the personnel in the parachute loft. It is compact, lightweight and durable enabling the medical officer to carry it with him to the accident site with facility. It is equipped with materials and instructions essential to the collection of specimens and information, especially where there is a fatality but also where there is only injury. The bag measures 13" high, 15" long and 2½" wide. Photos 1 through 4 show the bag and contents as held in place. Photo 5 shows the contents not easily identified in the other pictures. Each item of the contents is listed with necessary explanation in the table below.

"Conclusion: This bag has shown itself to be convenient and useful at this command. This report is forwarded with thought in mind that it may prove to be beneficial to some other command."

Item #	Description
1	Block of Paraffin
2	Box with tags, matches and seals for plaster bags
3	Heavy duty scissors for cloth and zippers
4	Box with urinary catheters, 3-21 gauge needle, razors, 3 - #10 blades, 6 blood collection tubes (for carbon monoxide, sugar, and alcohol)
5	Sterile gloves
6 thru 10	a. OPNAV Instruction 3750.6F (Navy Aircraft Accident, Incident and Ground Accident Reporting Procedures) with changes 1 and 2 b. BUMED Instruction 6510.4A (Determination of CO blood concentration) c. Instructions on use of Aircraft Accident Investigation Bag regarding procedures for special laboratory tests d. Information for Flight Surgeons involved in Aircraft Accident Investigations (Encl. 1 to Flight Surgeon's Newsletter 3-66) e. Form for release of remains by coroner to NAS Willow Grove, Pa. for proper disposition f. DD 1322 (Aircraft Accident Autopsy Report) g. DD 1323 (Toxicological Examination - Request & Report) h. Local check list for Decedent Affairs i. Maps of Philadelphia, Pennsylvania & Western New Jersey, Delaware & Maryland j. Worksheet for OPNAV Instruction 3750.6F k. Phone Numbers of AFIP and Naval Safety Center l. Names & Addresses of Coroners and/or Medical Examiners in 50 mile radius.

11 4 x 4 gauze
12 4 x 4 gauze
13 Disposable 30 cc syringes (2)
14 Plastic bags (10) and an intracardiac needle
15 Wide mouth jar for collection of 50 ml blood for toxicological studies
16 Same as #15
17 Wide mouth jar for collection of 50 ml urine for toxicological studies
18 Same as #17
19 Mineral oil
20 Tourniquets (2)
21 Stamp pad

Safety Center Comments:

This bag appears to be readily portable to an accident site and its contents should provide medical personnel at the scene with ample equipment and reference material to perform a thorough medical investigation. The primary designer of the kit, HMC Ray Elam, USNR-R, and others associated with its development and fabrication deserve recognition for their interest and ingenuity.

The question of whether such a kit should be fabricated and supplied by the Navy for general distribution has often arisen. In the past, it has been decided that the cost of such a development would not be warranted since:

a. Standardization of the kit and its equipment to meet the needs of all commands would be nearly impossible, and

b. Most of the contents and a bag are readily available or producible, cheaply, on a local basis.

Because of the above, suggested bag designs and content inventories which were particularly noteworthy have in the past been publicized with the suggestion that each medical facility manufacture its own and be ready when the accident occurs. (See "Crash Backpack," Approach, Oct 1966 and Flight Surgeon's Newsletter, Encl 2, Sept 1966 ; and "Flight Surgeon's Crash Kit," Flight Surgeon's Newsletter, 1st Quarter 1968.)

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Photo 1 - View of unopened bag

Photo 2 - View of bag with central flap on right

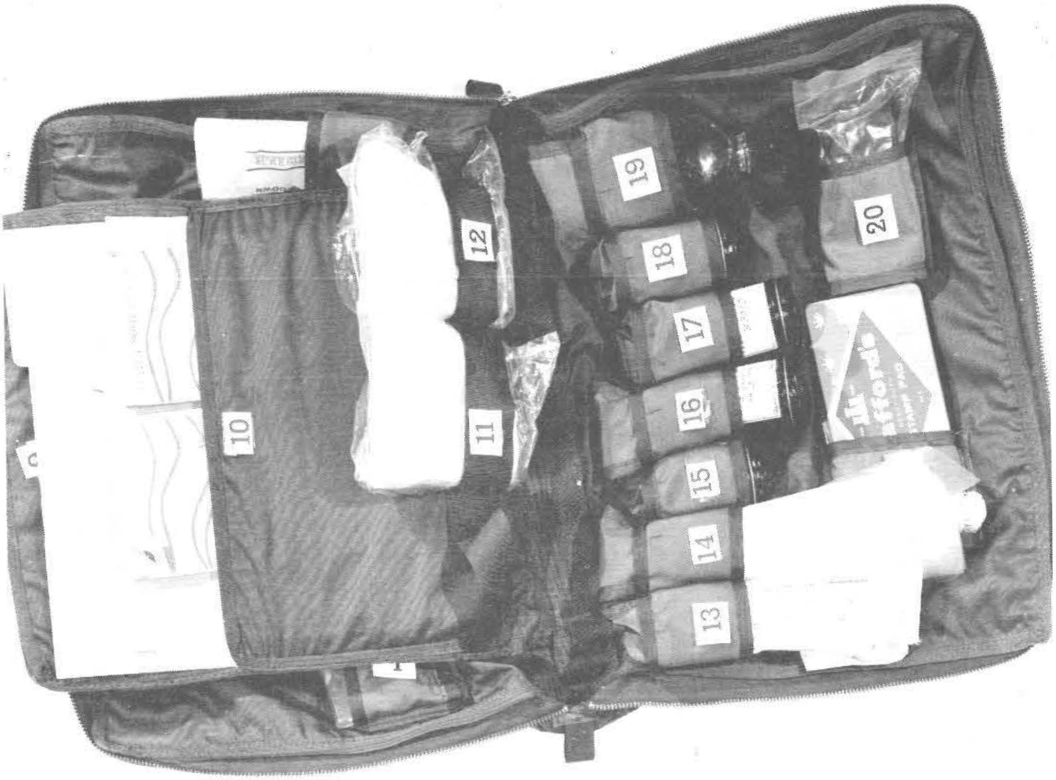

Photo 3 - View of bag with central flap on left

Photo 4 - View of bag with central flap upright

Photo 5 - View of contents spread out for identification

THE OUTSTANDING JET NAVAL AVIATOR

By CAPT R. F. Reinhardt, Naval Aerospace Medical Institute and CDR A. J. Adeeb, CVA-34.

(The following "speaking paper" for presentation at the 39th Annual Scientific Meeting, Aerospace Medical Association, Miami, May 6, 1968 is reprinted here with the permission of the authors.)

This paper describes the results of a phenomenological personality study of 104 outstanding jet aviators. Eighty-four of the group were "honor graduates" of their replacement pilot training squadrons, while 20 were student test pilots. All were given extensive psychologic test batteries, history questionnaires and were interviewed. Thirty-five of the group were, in addition, interviewed more intensively and in depth over a period of several hours.

Background

Seventy percent of these outstanding aviators were firstborn children, as opposed to an expected frequency of 45-50%, and an incidence of 55% in the overall Navy jet pilot population. As stated by other authors, there is an indubitable relation of birth order to the achievement of eminence, however defined. The dice are clearly loaded in favor of the firstborn. Sixty-three percent of the fathers of our study subjects had wartime service in the Navy, although less than 10% as aviators. This would suggest that the pilot's selection of Navy or Air Force service is influenced by hearing in childhood the father talk about his military service. Sixteen percent of the group were sons of attorneys or upper level, self-made executives. Identification with fathers in aggressive occupations would seem to make for success in military aviation.

Less than 10% reported prolonged absence of a father figure during the secondary school years, as compared with over 20% of a group of jet pilot failures. Other studies have shown that father absence in the pre-college years contributes to low ratings on responsibility and leadership, low motivation for achievement, inability to defer immediate for later gratification, low self-esteem, susceptibility to group influence and juvenile delinquency and predisposes to suicide in later life. In most (70%), the father-son relationship was described as one of great intensity, strengthening our impression that intimate father contact in the school years makes for success. It would seem that a companionship between father and son, in spite of differences in age, size and ability, permits a peaceful cultivation of initiative, a truly free sense of enterprise. Such companionship is indeed a lasting treasure for the son.

Eighty-four percent of the study group never had a bony fracture or personal injury requiring hospitalization and only 3% gave a history or more than one such accident. There is, then, in this group, no indication of thrill seeking, death defying counterphobic activity. It was surprising that 17% of the wives had career military fathers, most of whom were aviators. These wives may seek husbands in father-related occupations and they may also be more accepting of the hazards of military

aviation. Most of the pilots (74%) reported having chosen military aviation simply as a matter of expediency rather than as part of a long-term plan. Twenty-three percent seemed to be actively looking for difficult and complex tasks to master. Only 3% seemed to have become fighter pilots because of strong aggressive components in their personalities and as shown in their past histories. Most reported that the sense of mastery they derived was responsible for their choice of jet, as opposed to propeller or helicopter aviation. Many wanted to be alone with their complex man-aircraft unit. As one said, "No one could take hold of the controls in this aircraft except the pilot."

Even though much of the study was done before the present high level of activity in Viet Nam (prior to July, 1967), one-third of the study group had combat experience; of these, almost one-fifth had been shot down while on combat missions. This suggests that combat, and even difficult survival experiences, not only do not weaken the wish for further achievement but may even cause stronger identification with military aviation and create greater pride in one's skills. Only 14% of the group (as compared with 30% of a group of jet pilot failures) ever had major difficulty (two or more unsatisfactory flights in any single instrument syllabus) with instrument flight training. This reinforces our earlier impressions that performance during instrument training is one of the better predictors for success/failure in jet carrier aviation. Fifteen percent of the group reported having had a major aircraft accident, as compared with 23% of a group of failures. The implication might be that better pilots have fewer accidents or that accidents discourage some from continuing. Only 2% reported more than six sick call visits in the preceding 24 months, whereas 20% of the failure group reported more than 48 visits during the same time period. Evidently the achiever pilot does not need to send up a medical cry for help and is not searching, either consciously or unconsciously, for medical causes for grounding. Sixty-nine percent of the group expected to continue in naval aviation. Among the remaining 31%, the two most frequent planned careers were law and politics, which are by nature active, competitive and aggressive.

Examinational Data

Dreams, when reported by the study group, always carried themes of mastery and happy endings. In one dream, the aviator was a prisoner of war but managing difficult survival experiences very well, he eventually escaped to join his family. In another dream, an A-7 pilot dreamed that he one day took his A-7 out to have some fun "just fooling around and flying around and having a good time." Upon his return, he feared disciplinary action and had to face an initially somber commanding officer. The commanding officer then smiled in friendliness, however, and the dream ended.

On the Maudsley Personality Inventory (MPI), the extroversion scores are not significantly different from those of either jet pilot failures or the American college male norms. This would suggest that the high achiever pilot can either be outgoing and uninhibited or retiring and even a bit shy without compromising his chances. The scores on the neuroticism scale of the MPI are slightly lower than those of the overall jet pilot population but almost 50% lower than those of the American college male norms. The respective raw score means are 11 and 20 and the

mean of our study group was lower than that of 78% of American college males. The study group neuroticism mean was also far lower than that of any occupational or other type group reported in the literature. The implication is that the outstanding aviator has fewer neurotic symptoms, less felt anxiety, has emotional responses which are more adaptive and is less prone to break down under stress.

The Edwards Personal Preference Schedule is a forced-choice inventory which measures the relative strength of the individual's various personality traits as seen by the individual himself. As compared with the American male college student norms, the following scales differ significantly ($p = .001$ or better); (a) Achievement: greater need for success, competitive achievements and mastery. (b) Intraception: less need for introspection and "psychological mindedness." Their strength is in their ability to externalize their feelings and actively engage their environment. (c) Succorance: less dependence on others for help or support. (d) Abasement: less need for self-blame or guilt when things go wrong. (e) Nurturance: less need to do good things for others, less need for motherliness. (f) Endurance: a greater need to stick to any problem until it is solved. As compared with the overall jet pilot population, the outstanding achievers score significantly higher on need for achievement ($p = .02$) and suggestively higher on autonomy (need of and comfort in operating independently, preference for making decisions oneself) ($p = .10$).

The Minnesota Multiphasic Personality Inventory (MMPI) is a structured psychometric device which evaluates true-false responses to a large number of behavioral descriptive statements. Three of the scales merit specific comments: (a) The K scale was elevated with a T score of 61. A high K score represents defensiveness against psychological weakness. For psychiatric adjustment, it is good to be relatively high on K. It indicates prudence, circumspectness, inner substance, resiliency and capability of handling one's own problems. (b) The Ma scale was elevated with a T score of 58. Such a score suggests a socially flexible person with a need of and readiness for action. (c) the Si scale was low, with a T score of 44. While not measuring introversion-extroversion, this scale does measure the tendency to withdraw from social contact with others. One might say that individuals of this group, whether outgoing or self-sufficient, move among people with grace and ease.

Summary

The outstanding jet naval aviator is most often a first-born son. His father, whose profession encourages controlled, aggressive behavior, has a period of naval service somewhere in the background. During secondary school years, there was an intense companionship with many shared activities between father and son. Many of the wives are daughters of military aviators, indicating that wives' encouragement and approval of flying may be crucial. Most of these outstanding aviators enter aviation more by accident than long planning and when they remain, it is because they are good. They prefer single pilot aircraft because of their drive for mastery. Ejections, combat or otherwise, do not weaken their need for greater achievements. They are relative strangers to the dispensary for they don't call for help easily. If they don't continue flying, they most often expect to become attorneys or politicians (both of which allow for keen competition). Their night and day dreams

bring them victory but after difficulty. Socially, they may be introverts or extroverts but they have fewer neurotic symptoms than any other occupational or other type group reported. They are driven to achievement, have a high degree of persistence and are self-sufficient. However, they are not introspective, seldom spend time blaming themselves and are not driven to do things for others. They mix with their fellows easily. They are men of action, not speculation. This is the composite picture of the outstanding jet naval aviator.

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A Simple Way to Improve Lighting in Aircraft Maintenance and Assembly Areas

by
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Over the past many years there have been repeated complaints of inadequate illumination for work in aircraft maintenance and assembly areas. Recent reports on this subject come from such sources as Aviation Safety Council Meetings, the Naval Ship Research and Development Center, Occupational Health Releases (Bureau of Medicine and Surgery), and Naval Safety Center facilities inspections. One of the most serious problems is in getting sufficient illumination to the underside of aircraft. Instances are reported where illumination levels of near 20-foot-candles strike the deck but less than one foot-candle is reflected to the aircraft undersurfaces. This article is intended to demonstrate to those responsible for providing adequate lighting that use of a highly reflective deck can greatly enhance the illumination of these areas.

Adequate lighting in aircraft assembly and maintenance areas is necessary to insure safety and error-free maintenance requirements and to increase efficiency and comfort, especially when working on the underside of aircraft. The "ideal" level of illumination recommended for assembly, inspection, and repair areas is 100 foot-candles (Illuminating Engineering Society Lighting Handbook, 1966). For rough assembly work, a level of 30-50 foot-candles is recommended. Many areas are provided with only a fraction of this amount of illumination. NAVSHIPS 250-560-4 (Lighting of Ships) notes a requirement of seven foot-candles (minimum) for ships' hangar spaces, due to other practical limitations. Even with the recommended "ideal" levels, and particularly where there are lesser levels, the illumination needs to be reflected into the work areas, namely, onto the underside of aircraft. Application of the reflective deck principle can be a considerable aid to the seeing task as shown in the following experience:

> Recently the Naval Air Rework Facility, Norfolk, at the suggestion of the NAS Industrial Hygienist, applied a highly reflective white paint to the deck of a hangar area to reflect the available illumination from overhead luminaries (mercury-vapor lamps plus auxiliary quartz iodine filament lamps) onto the underside surfaces of aircraft. This has substantially alleviated the dark conditions under which maintenance and assembly personnel had frequently worked.

Many efforts were formerly made to improve the illumination by the use of deck fixtures which shines the light upward. These efforts failed due to "light blinding," glare and shadow problems. The improvement in illumination of the underside of aircraft after painting the deck under and immediately surrounding the aircraft is shown in the following "before and after" type night photographs (page 15).

For those who may conjecture that the preceding is "trick" photography, the Base photographer took great pains to use the same lens opening, same exposure time, same distance and the same printing technique for all these photographs. The difference noted in Figures 1 and 2 is mainly due to direction of the photographic "shot." In Figure 1 the photo was taken looking away from the central lighted areas (here there was some help from reflections off a painted deck area nearby). The apparent dramatic improvement of visibility in Figures 3 and 4 was subjectively confirmed by supervisors, workmen and the authors. These latter two made illumination measurements during night shift work and encouraged further extension of this principle.

A typical measurement made after painting the deck under and surrounding the aircraft with the highly reflective white paint showed the following levels:

	Foot-candles
Level on deck	30
Level reflected from the deck	23
Level at aircraft underside surfaces (fuselage & wing)	5-8

As seen from the above, about 80% of the illumination was reflected from the deck surface to give a fair illumination level to the undersurfaces. This is quite a contrast to the "less than one foot-candle" found under the fuselage in the case of unpainted and soiled concrete deck in the same general area. Even a painted area which had been soiled for several weeks continued to show beneficial results, as follows:

	Foot-candles
Level on the deck	28
Level reflected from the deck	17
Level under wing	7
Level under fuselage	3

In addition to the beneficial effect shown by the illumination measurements, workers and supervisors subjectively indicated a dramatic improvement in the visual environment (much easier to see and more comfortable). The entire hangar deck area used for aircraft spotting has subsequently been painted. Marked improvement in quality and quantity of production has been noted at this facility.

The deck paint used by Naval Air Rework Facility, Norfolk, was "Tylon High-Hiding" white enamel (manufactured by Baltimore Paint Co.). This was mixed in a ratio of 4:1 with epoxy resin concrete sealer. This is not a fire retardant paint. However, fire retardant white paints which have high reflectance values are available commercially. Paint procured under military specification MIL-E-17970C is a fire-retardant paint described as follows: Enamel, non-flaming, chlorinated-alkyd resin, soft-white semi-gloss, formula 124/58, reflectance value approximately 80%.

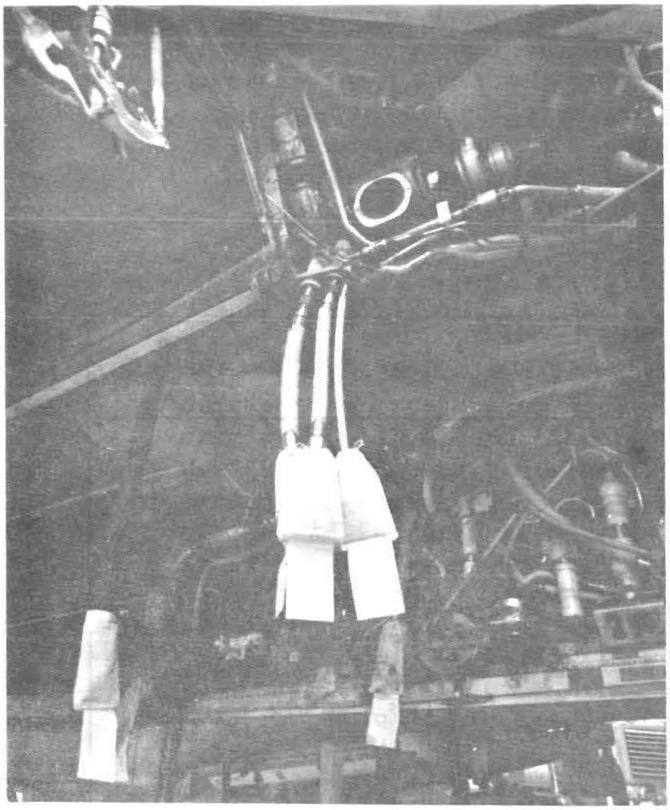

Fig. 1 - BEFORE painting deck white

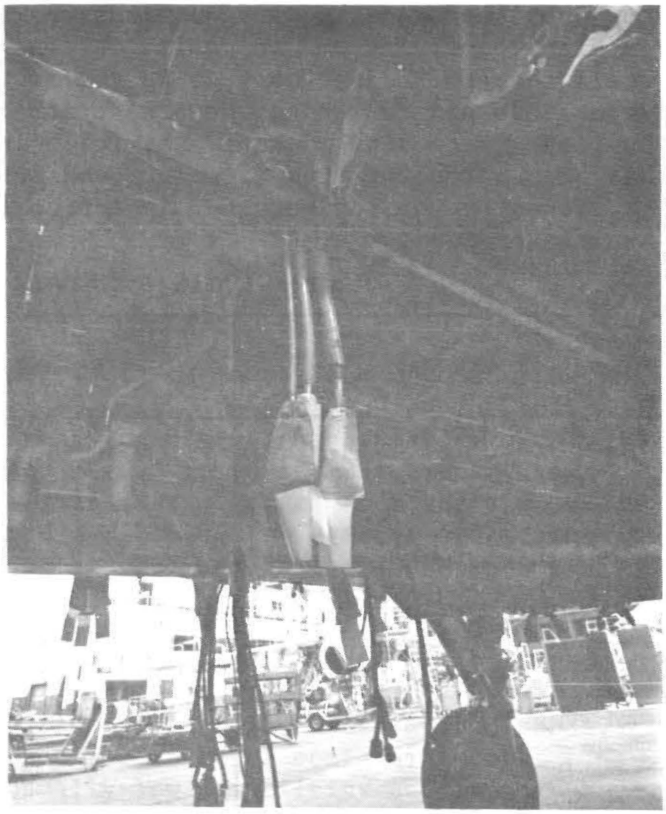

Fig. 2 - BEFORE painting deck white

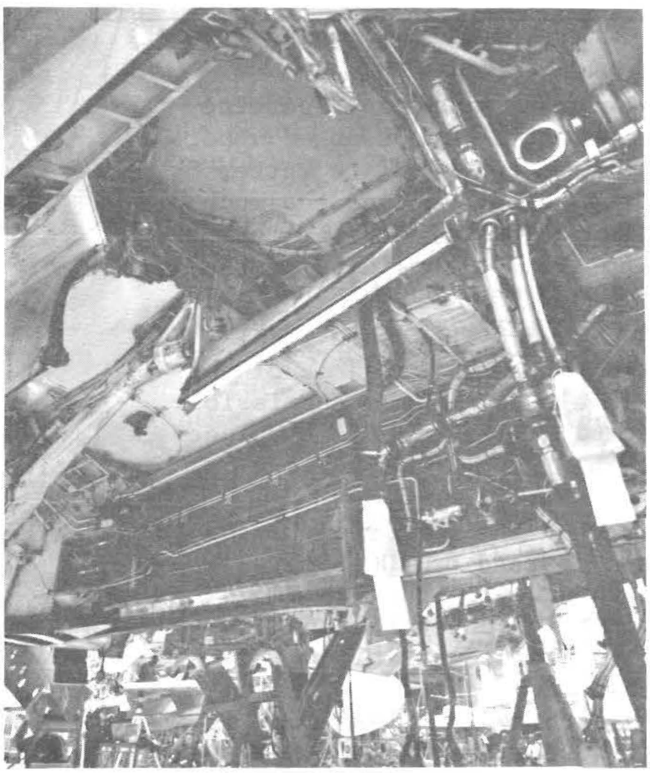

Fig. 3 - AFTER painting deck white

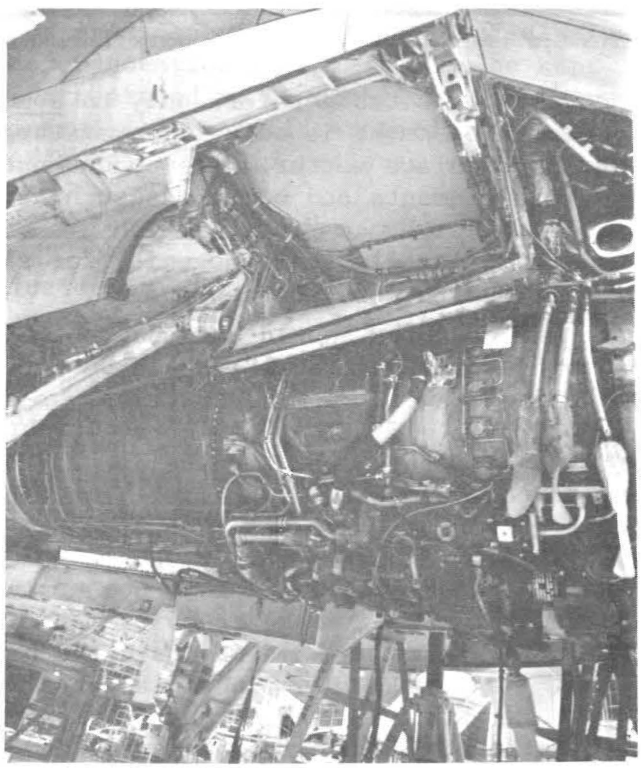

Fig. 4 - AFTER painting deck white

WHAT'S IN CIGARETTE SMOKE?

Much has been said in many publications about the adverse effects of smoking, on flying and on health in general but the layman is normally still unaware of just what is in the smoke. For those who have wondered about this and for those who are seriously deliberating whether to continue or to stop smoking, the following table may be of interest. It has been extracted from a recent book entitled Smoking and Health, published by the Advisory Commission to the Surgeon General, Public Health Services.

SOME GASES FOUND IN CIGARETTE SMOKE

COMPOUND	CONCENTRATION	SAFE LEVEL FOR INDUSTRIAL EXPOSURE*	TOXIC ACTION ON LUNG
	(ppm)	(ppm)	
Carbon Monoxide	42,000	100	Unknown
Carbon Dioxide	92,000	----------	None
Methane, ethane, propane, butane, etc.	87,000	500	None
Acetylene, ethylene, propylene, etc.	31,000	5,000	None
Formaldehyde	30	5	Irritant
Acetaldehyde	3,200	200	Irritant
Acrolein	150	0.5	Irritant
Methanol	700	----------	Irritant
Acetone	1,100	200	Irritant
Methyl ethyl ketone	500	250	Irritant
Ammonia	300	150	Irritant
Nitrogen Dioxide	250	5	Irritant
Methyl Nitrite	200	----------	Unknown
Hydrogen Sulfide	40	20	Irritant
Hydrogen Cyanide	1,600	10	Respiratory enzyme poison
Methyl Chloride	1,200	100	Unknown

*The values listed refer to time-weighted average concentrations for a normal work day.

Note that the table refers only to some of the gases found in cigarette smoke. The smoke is actually a mixture of many gases, uncondensed vapors and particulate matter. The uncondensed vapors and particulate matter contain elements and compounds such as the drug "nicotine" and the much-publicized tobacco "tars", which are carcinogenic (can produce cancer) or are "allegedly" carcinogenic (for those who are not convinced of the Public Health Service view point).

Another notation should be made on the third column. The "Safe level for industrial exposure" should be interpreted not as a "safe" level but a "guide" level. Some industries use these levels as maximum permissible exposure levels. They are more correctly termed Threshold Limit Values (TLV's) and represent a guideline as to what the "normal" worker can tolerate without adverse effect for 8 hours per day, 5 days per week. Some of the numbers (safe level) quoted are higher than the most recently quoted TLV's (e.g. carbon monoxide should read 50 ppm instead of 100 ppm). The important conclusion that one arrives at in studying the table is that cigarette smoke contains many substances in concentrations which for years have been considered harmful in the industrial environment. Many industries spend large sums of money for industrial health control measures to keep their workers from breathing much less concentrations. Concentrations noted in column two for carbon monoxide, hydrogen cyanide, nitrogen dioxide and acrolein would normally be immediately "hazardous to life" if breathed continuously for short periods. The smoker's "salvation" is that he does not inhale smoke continuously,

thus lowering the average concentration breathed and also the fact that humans usually will not tolerate the irritating effects for an appreciable period of time. Speaking of irritants, the chemical acrolein listed in the table is a chemical warfare agent. Research shows that the concentration indicated in the table is fatal to most white mice after a ten minute continuous exposure!

As with many decisions, the "pros" and "cons" must be weighed. Some of the "cons" in the smoking debate are expressed in the foregoing.

-John T. Maccioli

★★★★

"SAFETY" SOLVENTS

Apparently, there are no federal regulations which regulate the use of the term "safe" when applied to the trade name of a cleaning solvent or mixture. The term "safety solvent" or equivalent terms are widely used and can be very misleading and result in unsafe practices. For example, a "safety" solvent may be considered "safe" from the viewpoint of the manufacturer because it is non-damaging to surfaces or because it is not as hazardous with respect to fire and toxicity as other typical solvents.

Nature of "Safety" Solvents

Usually these "safety" solvents contain chlorinated hydrocarbons, higher boiling petroleum hydrocarbons or mixtures containing both. The petroleum hydrocarbons used are usually low in toxicity and usually have high flash and fire points. The chlorinated hydrocarbons generally have no flash or fire point but are toxic in varying degrees. These are combined to take advantage of the best qualities of each. Such a mixture can present both fire and toxicity hazards depending on the chemicals involved, on the manner of use and the evaporation rate. It must be kept in mind that some of these mixtures are stated to be non-flammable, yet in practical application the chlorinated solvent (fire-retardant component) may volatize first leaving a flammable liquid residue.

Substitution of methylchloroform for carbon "tet"

When poisonous carbon tetrachloride was "outlawed" a few years ago for use as a cleaning solvent in the Navy, it was replaced to a large extent by a variety of solvents. A popular and readily available substitute was methyl chloroform (1,1,1-trichloroethane) under various trade names. This is an efficient solvent for grease and oil and is regarded as non-flammable and much less toxic than carbon tetrachloride. A comparison of the threshold limit values (regarded by some as "maximum permissible exposure concentration level") shows 10 ppm for carbon tetrachloride and 350 ppm for methyl chloroform. However, in high concentrations methyl chloroform is a rapid and effective anesthetic which can produce unconsciousness in a matter of minutes. Several deaths have already resulted from use of large quantities of this solvent in confined spaces where adequate ventilation and respiratory protection was not used. In one Navy instance the brand name was NO-TET, indicating no carbon tetrachloride and the relative "safeness" of the product. The trade names of products which contain essentially methyl chloroform are numerous and some are linked to the term "safe."

Examples of Trade Names

Without disclosing composition data, the following are examples of some of the "safe" trade products which contain petroleum and/or chlorinated hydrocarbon solvents:

Safe Safety Solvent
Safe-Solv Cleaner #2
SafeT Strip
Safety Kleen (contains also carbon tetrachloride)
Safety Solvent #670
Safety Solvent FO-128
Safety Solvent RCT-9
Safety Solvent SS-25
Safetee Solvent
Saf-Tee Solvent
Saf-Sol

Precautions

Use of solvent mixtures of this nature warrants extreme caution when used in poorly ventilated and confined areas. Use in indoor areas may require local exhaust ventilation and/or use of chemical cartridge respirator, depending on quantity and manner of use. Work in closed spaces may require air line or OBA respirators and ventilation. These solvents are also "defatting" agents and irritate the skin and eyes; skin and eye protection is recommended to avoid contact exposure.

- John Maccioli

★★★★

NEW WARNINGS AGAINST SMOKING

▪ As fresh evidence of the ill effects of cigarette smoking continued to accumulate physicians and health agencies have issued increasingly strong calls for action to discourage the use and sale of cigarettes.

The latest announcement of new perils found in smoking was in the annual report to Congress on smoking and health by the Public Health Service. Citing an "increasing convergence" of evidence that directly linked smoking and heart disease, the report concluded: "Cigarette smoking can contribute to the development of cardiovascular disease and particularly to death from coronary heart disease."

Wrote Surgeon General William H. Stewart in his foreword: "The evidence attesting to the harmful effect of smoking on health has continued to mount during the past year, with new research findings confirming the clinical, experimental and epidemiologic relationship between tobacco smoking and many forms of illness related to it."

Reduced Life Span. The report noted that the average young smoker between the ages of 25 and 35 who smokes two packs a day reduces his life expectancy by eight years; smoking even half a pack a day can cut his life span by 4.6 years. Also reported was that in coronary heart disease, which caused 31 percent of all deaths in the United States last year, the incidence among men who smoked 26 or more cigarettes daily was about triple that for men who never smoked.

Stronger Warning. In a message sent to Congress with the report, Secretary of Health, Education and Welfare Wilbur J. Cohen urged that the warning printed on cigarette packages be strengthened from the present wording, "Caution: Cigarette smoking may be hazardous to your health," to "Warning: Cigarette smoking is dangerous to health and may cause death from cancer and other diseases." He also recommended that the warning be carried on cigarette vending machines and in all cigarette advertisements.

Oxygen Gap. Although many factors appeared to be involved in the effect of smoking on the heart, the report theorized that through several possible mechanisms smoking could increase the heart's demand for oxygen while reducing the supply. Evidence exists that carbon monoxide in cigarette smoke reduces the blood's ability to transfer oxygen to the tissues, and that the smoke triggers the release of norepinephrine, which increases the heart's need for oxygen. Said the report: "Thus the interaction of the factors that decrease oxygen supply to the myocardium and those that increase the myocardial demand for oxygen may play a major role in precipitating the fatal outcome in some individuals with coronary heart disease."

Physicians and Smoking. Medical societies have frequently called on physicians to take the initiative in discouraging cigarette smoking. Last spring a national survey showed that while almost all physicians agreed that smoking could be injurious to health and 60 percent had stopped smoking to protect their own health, fewer than two out of five were advising patients to quit or cut down except for patients with such symptoms as respiratory impairment, heart, lung or vascular disease; 88 percent urged such patients to stop smoking. More than 77 percent agreed that it was the physician's responsibility to try to convince his patients to stop smoking but the same percentage said that healthy smokers would not follow such advice; this appeared to be the main reason they failed to give it.

Last March the board of regents of the American College of Physicians passed a resolution condemning the use of tobacco, recommending that cigarette advertising be banned from television and urging its 14,300 members to undertake educational activities against smoking. Later the college published suggestions for physicians to follow in efforts to discourage smoking.

Recommended was that each physician advise all his patients to stop cigarette smoking, that he take action in institutions where he commands special authority, such as urging the removal of cigarette machines from his hospital, removing ashtrays and posting no-smoking signs in his office, insisting that colleagues not smoke in the rooms of his patients, in hospital corridors or in professional meetings, and that he try to discourage smoking outside his medical environment by such actions as asking smokers in railroad cars to stop smoking or move to a smoking car, protesting to airline stewardesses against the distribution of cigarettes on all meal trays, selling any tobacco stocks he owns.

Tobacco Addiction. In 1942 a British investigator, L. M. Johnston, found that nicotine injections appeased the cravings of habitual smokers. Since then a number of researchers have accepted the hypothesis that cigarette smoking is a true addiction. Nicotine, which constitutes about six percent of cigarette smoke and is an alkaloid that stimulates the central nervous system, is assumed to be the active principle.

Says Dr. Jerome H. Jaffe, psychiatrist and pharmacologist at the University of Chicago: "There is no question that smoking involves physical dependence on nicotine, withdrawal symptoms and a preoccupation with its use and compulsion to take it that constitute addictive behavior." Other researchers believe that although smokers may have some physical need for nicotine their psychologic dependence on smoking is more important.

In experiments with heavy smokers Dr. Peter H. Knapp, psychiatrist at Boston University, found that when cigarettes were taken away from one group they showed irritability, sleep disturbance, impaired concentration and memory, distorted time sense, profuse sweating, anxiety, restlessness, intense craving for tobacco. Another group was given denicotinized cigarettes without their knowing that the nicotine had been removed; they showed the same symptoms. Said Dr. Knapp: "Heavy cigarette smokers appear to be true addicts, showing not only social habituation but mild physiologic effects."

-Reprinted from MD, the medical newsmagazine, September, 1968.

COLD AND THE COMMON COLD

DOUGLAS and his associates in this issue of the *Journal* provide significant negative evidence on the long asked question of what is the effect of exposure to cold on the common cold. They chose to use for the test rhinovirus Type 15, a representative of the group of agents most frequently the cause of common colds. Their experiments were well controlled; measured doses of virus were given to volunteers selected as being free of antibody to the agent, and clinical and laboratory procedures documented thoroughly the response of exposed and control subjects to the inoculation. It is perhaps not surprising that the results, except that the usual slight leukocytosis characteristic of rhinovirus infection failed to develop, showed no effect of cold on the pathologic process.

If these results, obtained with a single strain of virus, are accepted as indicating generally that cold exposure has no effect on the common cold, what is the import of the finding? Two questions are immediately presented. How do we explain the old wives' tale that drafts cause colds and, more factually, how do we explain the occurrence in the temperate zones of the peak incidence of colds in the winter and early spring? One explanation for an effect of cold drafts, is that the chilly sensations that usually mark the onset of a cold have been misinterpreted as a causative factor in the illness when they have occurred while the infected person is exposed to low temperature. Since colds occur at about twice the average annual frequency during the late winter and early spring, when exposure to cold is most likely, there are inevitably many occasions when such coincidences arise.

Regarding seasonal variation several points can be made. Numerous experiments reveal that in a large percentage of susceptible volunteers quartered in warm rooms and inoculated with an infectious dose of any of several common-cold viruses a cold will develop. The now classic study on the island of Spitsbergen by Paul and Freese[1] revealed that when the islanders were isolated during the winter season, when exposure to cold weather must have occurred regularly, colds almost disappeared, but on return of ships in the spring, an epidemic of colds broke out. Thus, viral inoculation in the absence of exposure to cold resulted in a cold, but colds did not occur in a cold climate in the absence of a source of virus for transmission.

Monto and Johnson[2] showed, in a study in a village in the Republic of Panama, an increased frequency of colds at the start of the rainy season and a low frequency of such illnesses in the dry season. The annual mean temperature was 80°F, and fluctuations did not exceed 5°F. The authors suggested that the increase in colds with onset of the rainy season may have resulted from closer contact among the inhabitants, who spent more time indoors because of the rain.

Lidwell et al.[3] recently analyzed nine weather variables such as westerly weather, sunshine, rain and humidity, in relation to the occurrence of common colds in study populations in London and Newcastle. Examination was made of the variables for the day on which colds were reported and for each of the 29 preceding days. The results showed an association of onset of colds with low outside temperatures *two to four days earlier*. By regression analysis the association was found to be of sufficient magnitude to account for the greater part of the seasonal variation in the incidence of colds. The authors suggested that low outside temperatures promote transmission of the virus or the development of disease.

In view of the failure of Douglas et al. to show a significant effect of exposure to cold on the rhinovirus cold at the time of inoculation (two to four days before onset of illness) and at other times, a direct effect of cold on development of disease seems improbable. It is suggested, as an alternative, that cold weather, like rain in the tropics, keeps people indoors more of the time where opportunities for transmission of virus are greater. Whether or not this is true, the work of Douglas and his colleagues serves to de-emphasize the venerable concept of an effect of cold on the common cold. The problem now is to determine the extent to which rainy weather and low temperatures lead to increased indoor living and the aspects of the indoor environment that increase the dissemination of virus, which probably accounts for the increased frequency of colds.

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2. Monto, A. S., and Johnson, K. M. Community study of respiratory infections in tropics. I. Description of community and observations on activity of certain respiratory agents. *Am. J. Epidemiol.* **86**:78-92, 1967.
3. Lidwell, O. M., Morgan, R. W., and Williams, R. E. O. Epidemiology of common cold. IV. Effect of weather. *J. Hyg.* **63**:427-439, 1965.

-Reprinted with permission from
The New England Journal of Medicine,
Vol. 279, No. 14, 3 October 1968

Hepatitis Prophylaxis

The necessity of gamma globulin prophylaxis for infectious hepatitis was emphasized recently by the promulgation of BUMED Notice 6230 of 2 August 1968. This Notice called particular attention to the need for administering gamma globulin to all personnel assigned ashore in Vietnam.

The effectiveness of pre-exposure prophylaxis for infectious hepatitis is documented by several studies both in the United States and abroad. Available morbidity data indicates that, over a 24-month period, U.S. troops in Vietnam, who did not receive the gamma globulin pre-exposure prophylaxis, had a hepatitis case incidence rate four times greater than U.S. troops who did receive gamma globulin prior to arrival in-country.

The BUMED Instruction 6230.13B, Subj; Prophylaxis for Infectious Hepatitis, of 3 March 1966, indicates that gamma globulin shall be given within two weeks prior to arrival in Korea and mainland countries of Southeast Asia, including Vietnam. However, this Bureau has learned that, due to various administrative and logistic difficulties, many personnel are reporting for duty in Vietnam without this most important immunization.

In accordance with paragraph 3 of the aforementioned Notice and in order to afford optimum protection against infectious hepatitis for the individual as well as for the entire command, it is strongly recommended that the prescribed dose of gamma globulin be administered by the command detaching personnel for duty in Vietnam even though the period elapsed before reporting might, in some instances, be longer than two weeks. -- PrevMedDiv, BuMed.

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Aerospace Psychologist's Section

FSNL - 1st Quarter 1969

Lt Norm Lane, who will be receiving his Ph.D from Ohio State, reports aboard the Naval Safety Center on 1 January 1969. This welcome addition to the Life Sciences Department staff doubles the number of psychologists at the Safety Center. Norm is our only aviation expermental psychologist in uniform. Welcome aboard, Norm.

Getting their sea legs aboard SHANGRI LA, early in December, were LCDR's Tom Gallagher and Bob Wherry, Jr. and LT's Bob Kennedy, Joe Funaro and Curt Sandler. They were accompanied by CDR Jim Foster of OPTEVFOR, Norfolk. Prior to their visit to SHANGRI LA the group was briefed by MSC and civilian psychology personnel at NAVAIRSYSCOMHQ CNO, OPTEVFOR, NavAirLant and Atlantic Fleet Training Headquarters.

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Emotional Adjustment in Antarctic

Dr. Eric Gunderson of the Navy Medical Neuropsychiatric Research Unit, San Diego, writing in the October, 1968 Archives of Environmental Health, reported on studies which were conducted at Antarctic scientific stations on the emotional adjustment problems faced by naval and civilian personnel. He admits that incidences of gross psychiatric disturbances were too low to provide useful criteria for evaluating emotional adaptation to the Antarctic environment but states that they were able to develop two types of measures for this purpose. The first measure, derived from station leaders and peer ratings, provided an estimate of the emotional stability of each individual. The second measure was a symptom questionnaire, including a list of 10 common symptoms which were prevalent on previous expeditions. These symptoms pertained to insomnia, anxiety, depression and irritability.

Dr. Gunderson states that the study found that Navy personnel showed higher incidences of insomnia and depression than did the civilian scientists and these symptoms showed greater increases throughout the winter period for Navy men. Although Navy and civilian personnel did not differ appreciably in anxiety symptoms, both groups reported moderate increases in anxiety during the winter months when severe weather and darkness force station personnel indoors and limit their activities. Though both groups showed increases of irritability and hostility over the winter months, Navy personnel showed more symptomatic stress than did the civilians. Dr. Gunderson suggests that work role is a significant factor in determining the amount of emotional stress experienced.

Dr. Gunderson concludes that differences in emotional responses to the Antarctic environment can probably be attributed to changes in self esteem and group status which are related to the perceived importance of one's job. As evidence he offers that the feelings of usefulness of the civilian scientist remained unchanged throughout the winter but the Navy man evidences a significant reduction of such feelings. Also those who report the most reduction in feelings of usefulness report the most emotional symptoms near the end of winter.

Dr. Gunderson believes that environmental restrictions are important insofar as they affect the satisfaction of important personal needs. Different work roles require different personality and social characteristics. The adverse or positive effects of such personality characteristics as high achievement needs or strong affectional needs are enhanced by role requirements and by environmental limitations.

Abstracted by Robert A. Alkov, Ph.D

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Articles of interest to aerospace experimental psychologists or other psychologists working in safety or human engineering are being solicited for inclusion in future issues of the quarterly Flight Surgeon's Newsletter. If you are doing some interesting research with safety implications, or have some important news or just want to pass the word about activities, meetings, etc., please write to:

Naval Safety Center (Code 81)
Naval Air Station
Norfolk, Virginia 23511

Aerospace Physiologist's Section

This year's annual Aerospace Physiologist's meeting was hosted by the Naval Training Device Center in Orlando, Fla., 13-15 November. All but five of the active duty naval aerospace physiologists were in attendance for a meeting marked by superior organization and planning. It proved certainly to be a progressive step to future programs.

A welcome aboard was extended by CAPT J. N. Miller, commanding officer of the Naval Training Device Center, and greetings were conveyed by CAPT M. F. Keener, head of the Aerospace Physiology Training Branch, BUMED, and CDR P. W. Scrimshaw, planning committee chairman.

Two representatives of the Naval Training Device Center made presentations on Center activities and the physiological training device modification and modernization program plans for updating lighting, communications and servicable oxygen consoles. Dr. David L. Polis, of the Aerospace Medical Research Department at the Naval Air Development Center highlighted the "academic" portion of the agenda with a presentation on the "Biochemical Mechanism of Stress." Of equal interest was the presentation of LT R. Buckler, MSC, on the "Bubble Formation Theory in Dysbarism." Dr. Buckler is stationed at the Naval Medical Research Institute, Bethesda, Md. We will attempt to get reprints of their papers into the next Newsletter.

The Naval Air Systems Command was represented by J. B. Hall with a presentation on "Aviator's Personal and Survival Equipment Status" and LCDR H. Dickerson, MSC, who spoke on "Failsafe" and the "Physiological Training Significance of the MOR." CDR H. R. Bower, MSC, delivered a most informative presentation on "Hearing Loss and the Hearing Conservation Program," relating to the dynamic program conducted at his last duty station. A discussion of Naval Safety Center activities was presented by LT W. F. Cunningham, MSC, who is at present attached to the Life Sciences Department of the Naval Safety Center.

The formal program was concluded on 14 November with a presentation from the Bureau of Medicine and Surgery concerning the new Aerospace Physiology Training Report and plans for standardization. A tour of the Kennedy Space Center was conducted on the following day. Another highlight of this most successful meeting was the guest speaker at the banquet, CAPT M. D. Courtney, MC, who related the history of the aerospace physiologists and the Medical Service Corps in a speech which was well received.

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The mail address code for the Aerospace Physiologist's Section of the Flight Surgeon's Newsletter has been changed from 321 to 821.

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THE LITTLE THINGS CAN GET YA!!

The following item is reprinted from TAC ATTACK Magazine. The author is MAJ D. Choisser, Chief, Physiological Training Flight, Langley Air Force Base.

A T-33 took off from a western base and headed toward Sacramento at 1930 hours. The pilot, a well-qualified individual, was by himself. At 1940 hours he called Departure Control, leaving their frequency and giving a 2000 estimate for his next check point. He began feeling woozy immediately thereafter. Leveling off at 26,000 indicated, 24,000 cabin, heading 260 degrees, he switched to 100 percent oxygen. This did not seem to help so he went to a "Safety" setting. He awoke 25 minutes later (2005) heading 260 degrees, altitude 22,000 in a 500 fpm descent. Power was still at 100 percent. Not knowing where he was or what might happen, he called "MAYDAY" on guard and channel 1. No response on either frequency. Making further oxygen check, he found that the regulator hose had pulled loose at the CRU-8/P connector. The metal part (female) of the regulator hose was still attached to the connector, hence, his breathing had not become difficult. The hose had pulled away only about two inches, held by the intercom wire. He fixed the connection and reoriented himself. Twenty miles further and he would have been over the Pacific Ocean. The position report which he gave to Los Angeles Center he later described as goofed up, to say the least. It was not in sequence, full of hesitation and contained superfluous information. He then proceeded to Sacramento and made a "good penetration and a good landing."

Whether you call it PD McCRIPE or PRICE, the preflight oxygen check is a vital part of aircrew discipline. Do it right and don't sweat some of the little things.

Naval Safety Center Comment:

The above incident is a vivid example of inattention and lack of recall of physiological training. In addition to conducting a proper preflight, the pilot should have remembered his training and realized that safety pressure would have provided some difficulty in exhaling. He should have immediately suspected a major leak within the system.

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PERSONAL PROTECTIVE AND LIFE SUPPORT EQUIPMENT TRAINING

The Aerospace Physiology Training Units should offer some type of familiarization instruction for the operation of personal protective and life support equipment. There is no better opportunity to train aircrewmen in the proper utilization of such equipment. In fact, this training is a required mission under OPNAV Instruction 3710.7D (General NATOPS). Not only should aircrew be instructed in how and when to use protective equipment but also in the reasons it is necessary and the instructions requiring such use.

Difficulty with personal protective equipment continues to be a problem. During Fiscal Year 1968 there were 75 instances of improper use or procedures involving personal survival equipment and 40 cases where such equipment was available, was needed and was not used. Emphasizing specific directives is also important. One hundred and forty-two occasions of violations concerning directed use of equipment were reported in Fiscal 68. It appears that reiteration of the importance of retaining equipment in a survival situation is necessary. Thirty-one aircrewmen discarded equipment which was later needed. These figures are amazingly high. In Fiscal 68 there were some 457 instances of improper use of or lack of equipment for one reason or another. Proper training by Aerospace Physiology Training Units could perhaps reduce or eliminate a number of these problems.

It is suggested that if your unit is not already conducting some form of training in this area that you consider it, even if the squadrons have their own training. Duplication, particularly when it can be lifesaving, is not harmful. Finally, remember, the more dynamic the training, the better the retention.

-- LT Bill Cunningham, MSC
Aerospace Physiologist

ANNUAL INDEX FOR FLIGHT SURGEON'S NEWSLETTER, 1968

MEDICAL OFFICER'S REPORT OF A/C ACCIDENT, INCIDENT OR GROUND ACCIDENT
IDENTIFICATION, FLIGHT AND NARRATIVE DATA
OPNAV FORM 3750/8A (REV. 4-68) S/N 0107-731-8101

REPORT SYMBOL 3750-7

See Section H of OPNAVINST 3750.6

I. IDENTIFICATION

1. FROM *(Name and mailing address of activity)*			2. MOR NUMBER	3. DAMAGE CODE
4. TYPE OF MISHAP ☐ ACCIDENT ☐ GROUND ACCIDENT ☐ INCIDENT	5. NO. OF OCCUPANTS	6. DATE	7. MODEL A/C	8. BUNO
9. MODEL OTHER A/C IF INVOLVED		10. BUNO	11. NO. OF OCCUPANTS	12. DAMAGE CODE

13. INDIVIDUALS INVOLVED *(Use Additional Sheets if Required)* NAME *(Last, First and Middle Initial)*	14. RANK/RATE	15. BRANCH OF SERVICE	16. DUTY BILLET	17. INJURY CODE	18. DISPOSITION
PILOT AT CONTROLS AT TIME OF MISHAP A.					
CO-PILOT B.					
C.					
D.					

II. FLIGHT DATA *(At Time of Emergency)*

1. TERRAIN CLEARANCE	2. CABIN ALTITUDE	3. TIME AT CABIN ALTITUDE	4. AMBIENT ALTITUDE	5. TIME AT AMBIENT ALTITUDE
______ FEET	______ FEET	______ HOURS ______ MIN.	______ FEET	______ HOURS ______ MIN.

6. PLACE IN FORMATION

☐ A - SINGLE AIRCRAFT

☐ L - LEAD

☐ W - WING

Y - OTHER (SPECIFY) ______

8. HORIZON

☐ 1 - DISTINCT

☐ 2 - OBSCURED

8 - OTHER (SPECIFY) ______

7. CLOUD CONDITIONS

☐ 0 - CLEAR

☐ 1 - OVERCAST

☐ 2 - UNDERCAST

☐ 3 - IN CLOUDS

☐ 4 - IN AND OUT OF CLOUDS

8 - OTHER (SPECIFY) ______

9. DURATION OF FLIGHT:

HOURS ______ MIN. ______

III. NARRATIVE ACCOUNT OF MISHAP *(Continue on Reverse Side if necessary)*

MEDICAL OFFICER'S REPORT OF A/C ACCIDENT, INCIDENT OR GROUND ACCIDENT
MEDICAL INFORMATION
OPNAV FORM 3750/8B (REV. 4-68) S/N-0107-731-8201

REPORT SYMBOL 3750-7
See Section H of OPNAVINST 3750.6

1. DEGREE OF INJURY

☐ 1 - NONE ☐ 4 - FATAL ☐ 7 - MISSING, UNKNOWN
☐ 2 - MINOR ☐ 5 - MISSING, LAND
☐ 3 - MAJOR ☐ 6 - MISSING, WATER

2. DAYS HOSPITALIZED ____________
3. DAYS IN QUARTERS ____________
4. DAYS GROUNDED ____________
5. UNCONSCIOUS ________ HOURS ________ MIN.

5a. DISPOSITION

5b. EXPOSURE ☐ 1 - MILD ☐ 2 - MODERATE ☐ 3 - SEVERE

5c. SHOCK ☐ 1 - MILD ☐ 2 - MODERATE ☐ 3 - SEVERE

6. **INJURIES INCURRED DURING MISHAP**
(Use Standard DOD Terminology for Body Part, Diagnosis and Cause of Injury.) (See DDDIC. NAVMED P5082.)

	LEAVE THESE COLUMNS BLANK							
A. BODY PART:	P							
DIAGNOSIS:	D							
CAUSE:	C							
B. BODY PART:	P							
DIAGNOSIS:	D							
CAUSE:	C							
C. BODY PART:	P							
DIAGNOSIS:	D							
CAUSE:	C							
D. BODY PART:	P							
DIAGNOSIS:	D							
CAUSE:	C							
E. BODY PART:	P							
DIAGNOSIS:	D							
CAUSE:	C							

7.

LABORATORY TESTS	A. TISSUE TESTED	B. METHOD USED	C. LABORATORY DOING TEST	D. RESULT
CARBON MONOXIDE				
ALCOHOL				
LACTIC ACID				
OTHER (SPECIFY)				

8. **X-RAY RESULTS:** ☐ CHECK IF PERFORMED. SUBMIT RESULTS ON SEPARATE SHEET.

9.

DISEASES/DEFECTS PRESENT AT TIME OF MISHAP	METHOD OF DISCOVERY				WAIVERS (AS APPLICABLE)	
DIAGNOSIS	ANNUAL PHYSICAL	SICK CALL	AUTOPSY	OTHER	AUTHORITY	DATE

10. **AUTOPSY** CONDUCTED BY:

☐ M - MILITARY PATHOLOGIST ☐ F - FLIGHT SURGEON
☐ C - CIVILIAN PATHOLOGIST ☐ Y - OTHER
☐ PROTOCOL ATTACHED ☐ WILL BE FORWARDED

11. **MATERIAL** SUBMITTED TO AFIP:

☐ 1 - AUTOPSY REPORT ☐ 3 - PICTURES
☐ 2 - FROZEN TISSUE ☐ 4 - FIXED TISSUE

12. LIST ADDITIONAL INJURIES RECEIVED AS A RESULT OF THE MISHAP, AND ADD ANY PERTINENT REMARKS:

NAME	SERIAL NO.	A/C	BUNO

MEDICAL OFFICER'S REPORT OF A/C ACCIDENT, INCIDENT OR GROUND ACCIDENT
PSYCHOPHYSIOLOGICAL AND ENVIRONMENTAL FACTORS
OPNAV FORM 3750/8C (REV. 4-68) S/N-0107-731-8301

REPORT SYMBOL 3750-7
See Section H of OPNAVINST 3750.6

INSTRUCTIONS: Complete on all occupants of aircraft, all injured persons, and all persons possibly contributing to the cause of the mishap. Supervisory factors attributed to persons not in the aircraft and such factors as design or weather should be reported only for the person in primary control of the aircraft. Factors contributing to injury during mid-air collisions, crash landings, ditchings, etc., are to be considered part of survival phase. Use codes at right to show only those factors present or contributing in each phase.

PHASES OF MISHAP
A – Accident
E – Escape
S – Survival (includes parachute landings)
R – Rescue

FACTOR IMPORTANCE
D – Definitely contributed
S – Suspected factor
P – Condition present but did not contribute to accident or injury

FACTORS		A	E	S	R
1. SUPERVISORY FACTORS					
A. INADEQUATE BRIEFING	101				
B. ORDERED/LED ON FLIGHT BEYOND CAPABILITY	102				
C. POOR CREW COORDINATION	103				
D. OTHER (SPECIFY)	199				
2. PRE-FLIGHT FACTORS					
A. FAULTY FLIGHT PLAN	201				
B. FAULTY PRE-FLIGHT OF AIRCRAFT	202				
C. FAULTY PREPARATION OF PERSONAL EQUIPMENT	203				
D. HURRIED DEPARTURE	204				
E. DELAYED DEPARTURE	205				
F. INADEQUATE WEATHER ANALYSIS	206				
G. OTHER (SPECIFY)	299				
3. EXPERIENCE/TRAINING FACTORS					
A. INADEQUATE TRANSITION	301				
B. LIMITED TOTAL EXPERIENCE	302				
C. LIMITED RECENT EXPERIENCE	303				
D. FAILURE TO USE ACCEPTED PROCEDURES	304				
E. OTHER (SPECIFY)	399				
4. DESIGN FACTORS					
A. DESIGN OF INSTRUMENTS, CONTROLS	401				
B. LOCATION OF INSTRUMENTS, CONTROLS	402				
C. FAILURE OF INSTRUMENTS, CONTROLS	403				
D. COCKPIT LIGHTING	404				
E. RUNWAY LIGHTING	405				
F. LIGHTING OF OTHER AIRCRAFT	406				
G. PERSONAL EQUIPMENT INTERFERENCE	407				
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6. PSYCHOPHYSIOLOGICAL FACTORS					
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J. DRUGS PRESCRIBED BY MEDICAL OFFICER	610				
K. DRUGS, OTHER	611				
L. ALCOHOL	612				
M. VISUAL ILLUSIONS	613				
N. UNCONSCIOUSNESS	614				
O. DISORIENTATION/VERTIGO	615				
P. HYPOXIA	616				
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R. DYSBARISM	618				
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U. INATTENTION	621				
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Y. EXCESSIVE MOTIVATION TO SUCCEED	625				
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B. ACCELERATION FORCES, IMPACT	702				
C. DECOMPRESSION	703				
D. VIBRATION	704				
E. GLARE	705				
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G. HEAT	707				
H. COLD	708				
I. WINDBLAST	709				
J. VISIBILITY RESTRICTION–WEATHER, HAZE, DARKNESS	710				
K. VISIBILITY RESTRICTION–ICING, WINDOWS FOGGED, ETC.	711				
L. VISIBILITY RESTRICTION–DUST, SMOKE, ETC. IN ACFT	712				
M. WEATHER, OTHER THAN VISIBILITY RESTRICTION	713				
N. OTHER (SPECIFY)	799				
8. OTHER FACTORS TO BE CONSIDERED					
A. HABIT INTERFERENCE, USED WRONG CONTROL	801				
B. CONFUSION OF CONTROLS, OTHER	802				
C. MISREAD INSTRUMENT(S)	803				
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CONTINUED ON REVERSE SIDE

NAME	SERIAL NO.	A/C	BUNO

FACTORS		A	E	S	R	FACTORS		A	E	S	R
8. OTHER FACTORS TO BE CONSIDERED (Cont.)											
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G. TASK OVERSATURATION	807					M. NAVIGATIONAL ERROR	813				
H. INADEQUATE COORDINATION OR TIMING	808					N. INADVERTENT OPERATION, SELF-INDUCED	814				
I. MISJUDGED SPEED OR DISTANCE	809					O. INADVERTENT OPERATION, MECHANICALLY INDUCED	815				
J. SELECTED WRONG COURSE OF ACTION	810					P. OTHER (SPECIFY)	899				

REMARKS: *(Indicate item and describe circumstances in detail as necessary.)*

MEDICAL OFFICER'S REPORT OF A/C ACCIDENT, INCIDENT OR GROUND ACCIDENT
PERSONAL DATA
OPNAV FORM 3750/8D (REV. 4-68) S/N 0107-731-8401

I. CONTRIBUTING EFFECT

REPORT SYMBOL 3750-7
See Section H of OPNAVINST 3750.6

I. ROLE OF THIS INDIVIDUAL IN THE CAUSE OF THE MISHAP:

A. PRIMARY: ☐ 1. DEFINITE ☐ 2. PROBABLE ☐ 3. POSSIBLE
B. CONTRIBUTING: ☐ 4. DEFINITE ☐ 5. PROBABLE ☐ 6. POSSIBLE
☐ Ø. NONE ☐ 9. UNKNOWN

II. **BACKGROUND** *(Complete for all pilots and others who possibly contributed to mishap)*

A. DATE LAST LEAVE ENDED
B. DAYS DURATION LAST LEAVE

C. TYPE OF LEAVE LAST TAKEN
☐ 1. ORDINARY ☐ 2. EMERGENCY ☐ 3. REENLISTMENT ☐ 4. GRADUATION
☐ 5. SICK OR CONVALESCENT ☐ 6. DELAY ENROUTE ☐ 9. UNKNOWN

D. DATE OF LAST PREVIOUS FLIGHT

HOURS AND MINUTES FLOWN
E. IN LAST 24 HOURS ______ MIN. ______ F. IN LAST 48 HOURS ______ MIN. ______

MISSIONS FLOWN
G. IN LAST 24 HOURS ______ H. IN LAST 48 HOURS ______

HOURS AND MINUTES WORKED
I. IN LAST 24 HOURS ______ MIN. ______ J. IN LAST 48 HOURS ______ MIN. ______

HOURS SLEPT
K. IN LAST 24 HOURS ______ L. IN LAST 48 HOURS ______

M. CONTINUOUS DUTY PRIOR TO MISHAP ___ HOURS ______ MIN. ______
N. HOURS CONTINUOUSLY AWAKE PRIOR TO MISHAP ______
O. DURATION OF LAST SLEEP PERIOD ___ HOURS ______ MIN. ______
P. TIME IN COCKPIT PRIOR TO FLIGHT ______ HOURS ______ MIN.

III. PHYSIOLOGICAL, LOW PRESSURE CHAMBER AND VERTIGO TRAINING *(For all personnel)*

TYPE TRAINING ACCOMPLISHED	PLACE TRAINING ACCOMPLISHED	COMPLETED Month	COMPLETED Year	ROLE* IN MISHAP

**For role in mishap, use following code:*
0 – NO IMPORTANCE
1 – TRAINING DEFINITELY HELPED
2 – TRAINING POSSIBLY HELPED
3 – LACK OF TRAINING DEFINITELY A FACTOR
4 – LACK OF TRAINING POSSIBLY A FACTOR
9 – UNKNOWN

IV. ANTHROPOMETRIC DATA

a. DATE OF BIRTH: DAY ______ MONTH ______ YEAR ______
b. HEIGHT ______ INCHES
c. WEIGHT ______ POUNDS
d. SITTING HEIGHT ______ INCHES
e. TRUNK HEIGHT ______ INCHES
f. FUNCTIONAL REACH ______ INCHES
g. BUTTOCK-KNEE LENGTH ______ INCHES
h. LEG LENGTH ______ INCHES
i. SHOULDER WIDTH (BIDELTOID) ______ INCHES

V. GENERAL

1. NUMBER AND TYPE OF PRIOR MISHAPS *(Complete for all pilots, co-pilots, and/or other persons in control of aircraft)*

a. No. ______ b. DESCRIBE TYPE(S):

2. TOTAL YEARS OF FORMAL EDUCATION: ______

3. CHRONOLOGICAL ACCOUNT OF ACTIVITIES OF PREVIOUS 72 HOURS *(For all pilots, co-pilots, and/or persons possibly contributing to mishap)*:

NAME	SERIAL NO.	A/C	BUNO

MEDICAL OFFICER'S REPORT OF A/C ACCIDENT, INCIDENT OR GROUND ACCIDENT
PERSONAL, SURVIVAL AND ESCAPE EQUIPMENT
OPNAV FORM 3750/8E (REV. 4-68) S/N 0107-731-8501

REPORT SYMBOL 3750

See Section H of OPNAVINST 3750

NOMENCLATURE AND MODEL DESIGNATION	REQUIRED	AVAILABLE	USED	NEEDED	PROBLEMS *Indicate by code from list on reverse side.*
1. CLOTHING (SUITS, HEADGEAR, SHOES, GLOVES, VISOR, UNDERWEAR, ETC.)					
2. OXYGEN MASK					
3. OXYGEN REGULATOR					
4. LIFE VEST					
5. LIFE RAFT					
6. SURVIVAL RADIO(S)					
7. SIGNALLING DEVICES					
8. SURVIVAL KIT (CONTAINER)					
9. OTHER SURVIVAL GEAR					
10. RESTRAINTS (LAP BELTS, SHOULDER HARNESS, LEG RESTRAINTS)					
11. PARACHUTE-TYPE					
12. PARACHUTE CANOPY RELEASE					
13. PARACHUTE OPENING/DEPLOYMENT DEVICES					
14. SEAT TYPE					
15. OTHER (SPECIFY)					

16. EXPLAIN PROBLEMS (USE REVERSE SIDE IF NECESSARY)

CONTINUED ON REVERSE S

NAME	SERIAL NO.	A/C	BUNO

01 - NOT AVAILABLE–SUPPLY PROBLEM
02 - NOT AVAILABLE–LEFT BEHIND
03 - DISCARDED
04 - LOST
05 - DAMAGED–MINOR
06 - DAMAGED–MAJOR
07 - BURNED–MINOR
08 - BURNED–MAJOR
09 - DESTROYED BY EXTREME FORCE/FIRE
10 - FAILED TO OPERATE (RADIO, ACTUATOR, ETC.)
11 - OPERATED PARTIALLY
12 - DIFFICULTY LOCATING
13 - BEYOND REACH
14 - CONNECTION/CLOSURE DIFFICULTY
15 - CONNECTION/CLOSURE FAILURE
16 - RELEASE/DISCONNECT DIFFICULTY
17 - RELEASE/DISCONNECT FAILURE
18 - INADVERTENT RELEASE/DISCONNECT
19 - INADVERTENT ACTUATION
20 - ACTUATION DIFFICULTY
21 - ACTUATION FAILURE
22 - ACTUATED BY OTHER PERSON
23 - RESTRAINT/ATTACHMENT INADEQUACY
24 - RESTRAINTS/ATTACHMENTS NOT USED PROPERLY FOR MAXIMUM PROTECTION
25 - IMPROPER USE (OTHER)
26 - UNFAMILIAR WITH USE
27 - COLD HAMPERED USE
28 - INJURY HAMPERED USE
29 - WATER HAMPERED USE
30 - OTHER EQUIPMENT INTERFERED
31 - DONNING/REMOVAL PROBLEM
32 - DISCOMFORT/BULKINESS
33 - POOR FIT
34 - LEAKED
35 - MATERIEL DEFICIENCY
36 - DESIGN DEFICIENCY
37 - HANGUP/ENTANGLEMENT (WITH A/C OR OTHER EQUIPMENT)
38 - ENTANGLEMENT (PARACHUTE SUSPENSION LINES ONLY)-MAJOR
39 - ENTANGLEMENT (PARACHUTE SUSPENSION LINES ONLY)-MINOR
40 - DRAGGING (PARACHUTE ONLY)
41 - NON-STANDARD CONFIGURATION
42 - AIDED IN LOCATION/RESCUE
43 - NOT EFFECTIVE IN LOCATION/RESCUE (USED IN AREA OF SAR VEHICLES)
44 - PREVENTED/MINIMIZED INJURY
45 - EQUIPMENT PROBLEM (LOSS, FAILURE, ETC.) A FACTOR IN PRODUCING INJURY
46 - EQUIPMENT PRODUCED INJURY (HIT BY EJECTION SEAT, ETC.)
47 - FAILURE/DELAY IN USING COMPROMISED SURVIVAL/RESCUE
48 - ALL CREW EQUIPMENT (CODE ONLY ONCE)
49 - MAINTENANCE/INSTALLATION ERROR
50 - PROBLEM EXPERIENCED BY OTHERS IN ACTUATION/RELEASE OF EQUIPMENT
51 - EQUIPMENT DAMAGE–SELF INDUCED
52 - EQUIPMENT FAILURE–SELF INDUCED
60 - OTHER (SPECIFY)

MEDICAL OFFICER'S REPORT OF A/C ACCIDENT, INCIDENT OR GROUND ACCIDENT
ESCAPE - EGRESS COMPLETE FOR ALL INDIVIDUALS
OPNAV FORM 3750/8F (Rev. 4-68) S/N-0107-731-8601

REPORT SYMBOL 3750-7
See Section H of OPNAVINST 3750.6

1. LOCATION IN AIRCRAFT

A
- ☐ 1. COCKPIT OR PILOT'S COMPARTMENT
- ☐ 2. NAVIGATOR'S/ENGINEER'S COMPARTMENT
- ☐ 3. PASSENGERS' COMPARTMENT (SINGLE DECK)
- ☐ 4. PASSENGERS' COMPARTMENT (UPPER DECK)
- ☐ 5. PASSENGERS' COMPARTMENT (LOWER DECK)
- ☐ 8. OTHER COMPARTMENT
- ☐ 9. COMPARTMENT UNKNOWN

B. LONGITUDINAL LOCATION
- ☐ 1. FORWARD SECTION
- ☐ 2. CENTER SECTION
- ☐ 3. AFT SECTION
- ☐ 4. SECTION UNKNOWN

C. LATERAL LOCATION
- ☐ 2. CENTER
- ☐ 4. LEFT SIDE
- ☐ 5. RIGHT SIDE
- ☐ 9. UNKNOWN

D. DIRECTION FACING
- ☐ 1. FORWARD
- ☐ 2. AFT
- ☐ 3. SIDEWARD
- ☐ 9. UNKNOWN

E. USE OF SEAT
- ☐ Ø NOT IN SEAT
- ☐ 1. IN SEAT
- ☐ 2. BUNK/LITTER
- ☐ 9. UNKNOWN

2. METHOD OF ESCAPE *(More than one may apply)*

A. EJECTION
- ☐ 1. ACCOMPLISHED (FREE OF AIRCRAFT)
- ☐ 2. ATTEMPTED (NOT ACCOMPLISHED)
- ☐ 3. SEAT EJECTED ON IMPACT (TERRAIN)
- ☐ 4. INADVERTENT EJECTION
- ☐ 7. UNKNOWN IF ATTEMPT WAS MADE
- ☐ 8. SUSPECTED EJECTION
- ☐ Ø. DEFINITELY NOT ATTEMPTED

B. BAILOUT
- ☐ 1. ACCOMPLISHED (FREE OF AIRCRAFT)
- ☐ 2. ATTEMPTED (NOT ACCOMPLISHED)
- ☐ 3. BAILED OUT AFTER EJECTION ATTEMPT FAILED
- ☐ 7. UNKNOWN IF ATTEMPT WAS MADE
- ☐ 8. SUSPECTED BAILOUT
- ☐ Ø. DEFINITELY NOT ATTEMPTED

C. OTHER
- ☐ A. STANDARD EMERGENCY GROUND EGRESS
- ☐ 1. UNDERWATER EGRESS (NOT EJECTION)
- ☐ 3. DID NOT ESCAPE
- ☐ 4. EXIT UNASSISTED (OTHER THAN STANDARD EMERG. GROUND EGRESS)
- ☐ 5. CARRIED/ASSISTED OUT
- ☐ 6. BLOWN/THROWN OUT
- ☐ 7. JUMPED FROM A/C (AIRBORNE)
- ☐ 8. UNKNOWN IF ESCAPE ACCOMPLISHED
- ☐ 9. ESCAPED, METHOD UNKNOWN

3. INTENT FOR ESCAPE

- ☐ 1. INTENTIONAL
- ☐ 2. UNINTENTIONAL, SELF INDUCED
- ☐ 3. UNINTENTIONAL, MECHANICAL
- ☐ 4. INTENT UNKNOWN

4. EXIT USED

- ☐ 1. NORMAL EXIT
- ☐ 2. EJECTED THROUGH CANOPY
- ☐ 3. EMERGENCY EXIT
- ☐ 8. OTHER
- ☐ 9. UNKNOWN

5. COCKPIT/CABIN CONDITION AFTER IMPACT

- ☐ Ø. NO DAMAGE (OTHER THAN CANOPY LOSS, ETC.)
- ☐ 1. MINOR DAMAGE (DEFINITELY HABITABLE)
- ☐ 2. REASONABLY INTACT (PROBABLY HABITABLE)
- ☐ 3. MAJOR DAMAGE (PROBABLY NOT HABITABLE)
- ☐ 4. DESTROYED (DEFINITELY NOT HABITABLE)
- ☐ 9. UNKNOWN

6. ORDER OF ESCAPE *(1st, 2nd, etc.)* ______

7. REASON(S) FOR ESCAPE *(More than one may apply)*

- ☐ A. FIRE/EXPLOSION/SMOKE
- ☐ B. LOSS OF CONTROL
- ☐ C. ENGINE FAILURE
- ☐ D. FUEL EXHAUSTION
- ☐ E. STRUCTURAL FAILURE
- ☐ F. MID-AIR COLLISION
- ☐ G. WATER IMPACT
- ☐ H. GROUND/STRUCTURE IMPACT
- ☐ J. LAUNCH FAILURE
- ☐ K. ARRESTMENT FAILURE
- ☐ Y. OTHER
- ☐ Z. UNKNOWN

CONTINUED ON REVERSE SIDE

NAME	SERIAL NO.	A/C	BUNO

8. COMMUNICATIONS PRIOR TO ESCAPE

- [ ] 1. DISTRESS SIGNAL TRANSMITTED
- [ ] 2. POSITION FIX TRANSMITTED
- [ ] 3. EMERGENCY IFF (MANUAL)
- [ ] 4. EMERGENCY IFF (AUTOMATIC)
- [ ] 9. UNKNOWN
- [ ] Ø. NONE

9. NUMBER OF PREVIOUS:

EJECTIONS ________ EMERGENCY BAILOUTS ________

OTHER PARACHUTE JUMPS (TRAINING, SKYDIVING, ETC.) ________

10. TERRAIN OF PARACHUTE LANDING OR CRASH SITE

(More than one may be applicable)

- [ ] A - OPEN SEA
- [ ] B - LARGE LAKE
- [ ] C - RIVER
- [ ] D - DEEP WATER, OTHER
- [ ] E - SHALLOW WATER
- [ ] F - DEEP SNOW
- [ ] G - THICK ICE
- [ ] H - MARSH/SWAMP/MUD
- [ ] U - HARD GROUND
- [ ] J - SOFT GROUND
- [ ] K - BUILDING
- [ ] L - FLIGHT DECK
- [ ] M - DENSE WOODS
- [ ] N - IN TREES
- [ ] T - THROUGH TREES
- [ ] P - RAVINE/STEEP SLOPE
- [ ] Q - ROCKS
- [ ] R - IN/NEAR FIREBALL
- [ ] S - DESERT
- [ ] Y - UNKNOWN
- [ ] Z - OTHER ________

11. AIRCRAFT ATTITUDE AT TIME OF ESCAPE

(Either in flight or after crash, ditching, etc.)

- [ ] NOSE UP
- [ ] NOSE DOWN ________ DEGREES
- [ ] RIGHT BANK
- [ ] LEFT BANK ________ DEGREES
- [ ] A. NOSE DOWN SPIN
- [ ] F. DISINTEGRATION
- [ ] B. FLAT SPIN
- [ ] G. INVERTED
- [ ] C. OSCILLATING SPIN
- [ ] H. MUSHING
- [ ] D. ROLLING
- [ ] Z. UNKNOWN
- [ ] E. TUMBLING
- [ ] Y. OTHER (DESCRIBE) ________

12. EJECTION SEAT/PARACHUTE TRAINING

(Not required for passengers who had no opportunity to escape)

TYPE OF TRAINING	TOTAL HOURS IN TRAINING	DATE OF LAST TRAINING	ROLE*
LECTURES/DEMONSTRATIONS			
TRAINING FILMS			
UNARMED EJECTION SEAT			
ARMED SEAT ON TOWER			
JUMP SCHOOL			
PARASAIL TRAINING			
OTHER (SPECIFY)			

*Use codes below to indicate role training played in this mishap.

Ø - NO IMPORTANCE
1 - TRAINING DEFINITE HELP
2 - TRAINING POSSIBLE HELP
3 - LACK OF TRAINING FACTOR
4 - LACK OF TRAINING POSSIBLE FACTOR
9 - TRAINING ROLE UNKNOWN

13. EGRESS DIFFICULTIES *(Place X in appropriate column)*

B - Before; D - During; A - After

		GROUND				WATER				AIR		
		B	D	A		B	D	A		B	D	A
1. BUFFETING	01				01				01			
2. G FORCES	02				02				02			
3. WINDBLAST	03				03				03			
4. SEAT PINS NOT REMOVED	04				04				04			
5. DIFFICULTY LOCATING CANOPY JETTISON MECHANISM	05				05				05			
6. HAMPERED BY CLOTHING	06				06				06			
7. HAMPERED BY EQUIPMENT (INCLUDE BODY ARMOR)	07				07				07			
8. HAMPERED BY INJURIES	08				08				08			
9. DIFFICULTY RELEASING CANOPY/HATCH	09				09				09			
10. FAILURE TO RELEASE CANOPY/HATCH	10				10				10			
11. DIFFICULTY LOCATING/REACHING NORMAL EJECTION MECHANISM	11				11				11			
12. DIFFICULTY LOCATING/REACHING ALTERNATE EJECTION MECHANISM	12				12				12			
13. FACE CURTAIN FAILED TO ACTIVATE SEAT	13				13				13			
14. FACE CURTAIN PROBLEM (LOCATING, REACHING, ETC.)	14				14				14			
15. SEAT PAN FIRING HANDLE FAILED TO ACTIVATE SEAT	15				15				15			
16. SEAT PAN FIRING HANDLE PROBLEM (LOCATING, ETC.)	16				16				16			
17. CANOPY JETTISON PROBLEM	17				17				17			
18. CANOPY JETTISON FAILURE (AUTOMATIC MEANS)	18				18				18			

CONTINUED ON NEXT PAGE

OPNAV FORM 3750/8F (Rev. 4-68) (Continued)

13. EGRESS DIFFICULTIES *(Place X in appropriate column) (Continued)*

B - Before; D - During; A - After

		GROUND				WATER				AIR		
		B	D	A		B	D	A		B	D	A
19. COULD NOT OPEN CANOPY/HATCH	19				19				19			
20. DIFFICULTY RELEASING RESTRAINTS	20				20				20			
21. DIFFICULTY REACHING HATCH/EXIT-OBSTRUCTIONS	21				21				21			
22. DIFFICULTY REACHING HATCH/EXIT-INJURIES	22				22				22			
23. DIFFICULTY REACHING HATCH/EXIT-A/C ATTITUDE	23				23				23			
24. DIFFICULTY REACHING HATCH/EXIT-EQUIPMENT HANGUP	24				24				24			
25. PINNED DOWN IN A/C (OTHER THAN EQUIPMENT HANGUP)	25				25				25			
26. CONFUSION/PANIC/DISORIENTATION	26				26				26			
27. DARKNESS–NO VISUAL REFERENCE	27				27				27			
28. FIRE/SMOKE/FUEL	28				28				28			
29. ANTHROPOMETRIC PROBLEM	29				29				29			
30. PERSONAL EQUIPMENT FACTOR (OTHER THAN HANGUP)	30				30				30			
31. UPPER EXTREMITIES HIT COCKPIT STRUCTURES	31				31				31			
32. LOWER EXTREMITIES HIT COCKPIT STRUCTURES	32				32				32			
33. MAN STRUCK CANOPY/CANOPY BOW	33				33				33			
34. STRUCK EXTERNAL SURFACE OF AIRCRAFT	34				34				34			
35. FLAILING - UPPER EXTREMITIES	35				35				35			
36. FLAILING - LOWER EXTREMITIES	36				36				36			
37. DROGUE SLUG SWINGING AT MAN	37				37				37			
38. DROGUE SLUG STRUCK MAN	38				38				38			
39. MAN STRUCK BY OTHER EQUIPMENT	39				39				39			
40. MAN STRUCK BY SEAT	40				40				40			
41. SEAT SEPARATION DIFFICULTY	41				41				41			
42. SEAT/PARACHUTE ENTANGLEMENT	42				42				42			
43. MAN TANGLED IN CHUTE RISERS–MAJOR	43				43				43			
44. MAN TANGLED IN CHUTE RISERS–MINOR	44				44				44			
45. PARACHUTE LINE OVER	45				45				45			
46. MAN HELD ON TO SEAT	46				46				46			
47. TUMBLING/SPINNING	47				47				47			
48. PARACHUTE DID NOT OPEN	48				48				48			
49. PARACHUTE STREAMED	49				49				49			
50. INADVERTENT OPENING OF LAP BELT	50				50				50			
51. FAILURE OF LAP BELT TO OPEN	51				51				51			
52. INRUSHING WATER	52				52				52			
53. COLD	53				53				53			
54. UNCONSCIOUS/DAZED	54				54				54			
55. OTHER	98				98				98			

REMARKS OR CONTINUATION: *(Index each remark with code from above)*

NAME	SERIAL NO.	A/C	BUNO

C-31668

MEDICAL OFFICER'S REPORT OF A/C ACCIDENT, INCIDENT OR GROUND ACCIDENT
EJECTION OR BAILOUT
OPNAV FORM 3750/8G (REV. 4-68) S/N 0107-731-8701

REPORT SYMBOL 3750-7

See Section H of OPNAVINST 3750.6

(Complete for all inflight escapes and ejections)

1. TIME FROM EMERGENCY UNTIL ESCAPE ATTEMPT WAS INITIATED

HOURS ____________ MINUTES ____________ SECONDS ____________

2. DELAY IN INITIATING ESCAPE DUE TO:

- ☐ 1. ATTEMPTING TO OVERCOME PROBLEM
- ☐ 2. AVOIDING POPULATED AREA
- ☐ 3. AVOIDING UNSUITABLE TERRAIN
- ☐ 4. GAINING ALTITUDE
- ☐ 5. LOSING ALTITUDE
- ☐ 6. LOSING AIRSPEED
- ☐ 8. OTHER
- ☐ 9. UNKNOWN

3. TERRAIN CLEARANCE AT TIME OF:

A. 1. ESCAPE (FEET) ____________ 2. PARACHUTE OPENING (FEET) ____________

B. 1. AIRSPEED AT TIME OF ESCAPE ____________ KIAS

2. GROUND/FORWARD SPEED (IF NOT AIRBORNE) ____________ K

C. ☐ 1. PARACHUTE DID NOT OPEN ☐ 2. PARACHUTE STREAMED

4. PROTECTIVE HELMET:

	CHIN STRAP FASTENED			HELMET VISOR LOWERED		
	YES	NO	UNK	YES	NO	UNK
1. BEFORE EMERGENCY	☐	☐	☐	☐	☐	☐
2. DURING EGRESS	☐	☐	☐	☐	☐	☐
3. DURING CHUTE LANDING	☐	☐	☐	☐	☐	☐
4. CHIN STRAP FASTENED SNUGLY				☐	☐	☐
5. NAPE STRAP FASTENED SNUGLY				☐	☐	☐

5. ZERO LANYARD:

A. WHEN CONNECTED

- ☐ Ø. AVAILABLE, NOT CONNECTED
- ☐ 1. PRIOR TO EMERGENCY
- ☐ 2. DURING EMERGENCY
- ☐ 3. TIME UNKNOWN
- ☐ 8. NA/NOT AVAILABLE
- ☐ 9. UNKNOWN

B. SURVIVAL FACTOR

- ☐ Ø. NOT A FACTOR IN SURVIVAL
- ☐ 1. FACTOR IN SURVIVAL
- ☐ 2. NOT A FACTOR IN NON-SURVIVAL
- ☐ 3. FACTOR IN NON-SURVIVAL
- ☐ 9. UNKNOWN IF FACTOR

6. AUTOMATIC LAP BELT RELEASE

- ☐ Ø. DID NOT OPEN OR RELEASE
- ☐ 1. RELEASED AUTOMATICALLY AS DESIGNED
- ☐ 2. OPENED MANUALLY
- ☐ 3. OPENED INADVERTENTLY
- ☐ 8. UNKNOWN HOW RELEASED
- ☐ 9. UNKNOWN IF RELEASED

7. REMOVAL OF AIRCRAFT CANOPY

A. INTENT

- ☐ 1. INTENTIONAL
- ☐ 2. UNINTENTIONAL, SELF-INDUCED
- ☐ 3. UNINTENTIONAL, MECHANICAL
- ☐ 9. UNKNOWN

B. INITIATED BY:

- ☐ 1. THIS INDIVIDUAL
- ☐ 2. ANOTHER INDIVIDUAL
- ☐ 9. UNKNOWN

7. REMOVAL OF AIRCRAFT CANOPY *(Continued)*

C. REMOVAL

- ☐ Ø. DEFINITELY NOT ATTEMPTED
- ☐ 1. ACCOMPLISHED
- ☐ 2. ATTEMPTED (UNSUCCESSFUL)
- ☐ 3. UNKNOWN IF ATTEMPTED

D. METHOD

- ☐ 1. ARM REST/LEG BRACE
- ☐ 2. FACE CURTAIN
- ☐ 3. SEAT PAN HANDLE
- ☐ 4. MANUALLY UNLOCKED
- ☐ 5. EXTERNAL FORCE
- ☐ 6. CANOPY JETTISON HANDLE
- ☐ 9. UNKNOWN
- ☐ 8. OTHER (DESCRIBE)

8. EJECTION

A. INTENT

- ☐ 1. INTENTIONAL
- ☐ 2. UNINTENTIONAL
- ☐ 9. UNKNOWN

B. INITIATED BY

- ☐ 1. THIS PERSON
- ☐ 2. ANOTHER PERSON
- ☐ 3. EXTERNAL FORCE
- ☐ 9. UNKNOWN

C. METHOD

- ☐ 1. ARM REST/LEG BRACE
- ☐ 2. FACE CURTAIN
- ☐ 3. SEAT PAN HANDLE
- ☐ 4. SEAT SEQUENCER
- ☐ 5. IMPACT
- ☐ 6. FIRE
- ☐ 7. MECHANICAL FAILURE
- ☐ 8. OTHER EXTERNAL FORCE
- ☐ 9. UNKNOWN

9. BODY POSITION AT EJECTION *(As compared to optimal)*

		A. HEAD	B. HIPS	C. FEET	D. ELBOWS
OPTIMAL	1				
FORWARD	2				
UPWARD	3				
LATERAL	4				
UNKNOWN	9				

10. POSITION OF EJECTION SEAT

- ☐ 1. FULL UP
- ☐ 2. FULL DOWN
- ☐ 3. INTERMEDIATE POSITION
- ☐ 9. UNKNOWN

11. METHOD OF SEPARATING MAN FROM SEAT

- ☐ Ø. DID NOT SEPARATE
- ☐ 1. SEAT SEPARATOR
- ☐ 2. SPONTANEOUS/TUMBLING
- ☐ 3. PUSHED SELF AWAY
- ☐ 4. PERSONNEL PARACHUTE
- ☐ 8. OTHER
- ☐ 9. UNKNOWN

CONTINUED ON REVERSE SIDE

NAME	SERIAL NO.	A/C	BUNO

12. TYPE OF SEAT SEPARATION

- ☐ Ø. NONE
- ☐ 1. ROTARY
- ☐ 2. BLADDER
- ☐ 3. PARACHUTE
- ☐ 4. SNUBBING LANYARD

13. METHODS OF DEPLOYING PARACHUTE

- ☐ Ø. NOT DEPLOYED
- ☐ 1. AUTOMATIC TIMER
- ☐ 2. ANEROID
- ☐ 3. BALLISTIC DEVICE
- ☐ 4. ZERO LANYARD
- ☐ 5. STATIC LINE
- ☐ 6. MANUAL
- ☐ 8. OTHER
- ☐ 9. UNKNOWN

14. PARACHUTE OPENING SHOCK

- ☐ Ø. NEGLIGIBLE
- ☐ 1. MODERATE
- ☐ 2. SEVERE
- ☐ 9. UNKNOWN

15. OSCILLATIONS	Ø-NEGLIGIBLE	1-MODERATE	2-SEVERE	9-UNKNOWN
A. DURING DESCENT				
B. DURING LANDING				

16. PARACHUTE DAMAGE *(Give number of)*

1. SEVERED SHROUD LINES ______
2. MISSING PANELS ______
3. TORN PANELS–MAJOR ______
4. TORN PANELS–MINOR ______

17. CAUSE OF PARACHUTE DAMAGE

- ☐ 1. OPENING SHOCK
- ☐ 2. FOULED ON EJECTION SEAT
- ☐ 3. FOULED ON A/C
- ☐ 4. FIRE
- ☐ 5. ON LANDING
- ☐ 6. IN TREES
- ☐ 7. DRAGGING
- ☐ 8. OTHER (DESCRIBE)
- ☐ 9. UNKNOWN

18. FOUR LINE CUT DISREGARD, *(Air Force Item only)*

19. DIRECTION FACED AT CHUTE LANDING

- ☐ 1. DIRECTLY FACING
- ☐ 2. FACING AWAY
- ☐ 3. QUARTERING, FACING
- ☐ 4. QUARTERING, BACK
- ☐ 5. DIRECTLY SIDEWAYS
- ☐ 9. UNKNOWN

20. LANDING CONDITIONS

A. TOTAL WEIGHT UNDER PARACHUTE: ______ LBS

B. SURFACE WINDS ______ KNOTS

C. DRAGGED BY CHUTE ☐ 1. YES ☐ Ø. NO

D. DISTANCE DRAGGED: ______ YARDS

21. PARACHUTE LANDING POSITION TECHNIQUES

A.
- ☐ Ø. COULD NOT SEE
- ☐ 1. LOOKING AHEAD
- ☐ 2. LOOKING DOWN
- ☐ 8. OTHER
- ☐ 9. UNKNOWN

C.
- ☐ 1. MUSCLES TENSED
- ☐ 2. MUSCLES TOO TENSE
- ☐ 3. TOO RELAXED
- ☐ 8. OTHER
- ☐ 9. UNKNOWN

B.
- ☐ 1. FELL OBLIQUELY
- ☐ 2. FELL BACKWARD
- ☐ 3. FELL FORWARD
- ☐ 8. OTHER
- ☐ 9. UNKNOWN

D.
- ☐ 1. PROPER POSITION
- ☐ 2. KNEES LOCKED
- ☐ 3. ARMS IN POOR POSITION
- ☐ 8. OTHER
- ☐ 9. UNKNOWN

22. DEPLOYED BEFORE LANDING

	1 - YES	Ø - NO	9 - UNKNOWN
A. SURVIVAL KIT			
B. LIFE RAFT			
C. LIFE VEST			

23. CANOPY DEFLATION POCKETS

- ☐ Ø. NOT EFFECTIVE IN COLLAPSING CHUTE
- ☐ 1. AIDED IN COLLAPSING CHUTE
- ☐ 7. NOT INSTALLED
- ☐ 8. UNKNOWN IF INSTALLED
- ☐ 9. UNKNOWN IF EFFECTIVE

REMARKS:

MEDICAL OFFICER'S REPORT OF A/C ACCIDENT, INCIDENT OR GROUND ACCIDENT
SURVIVAL AND RESCUE
OPNAV FORM 3750/8H (REV. 4-68) S/N 0107-731-8800

REPORT SYMBOL 3750-7

See Section H of OPNAVINST 3750.6

1. SURVIVAL TRAINING

Use Code at right to indicate the role this person's training played in survival.

Ø - NOT A FACTOR
1 - DEFINITELY HELPED
2 - POSSIBLY HELPED
3 - LACK OF TRAINING DEFINITE FACTOR
4 - LACK OF TRAINING POSSIBLE FACTOR
9 - ROLE UNKNOWN

	TYPE TRAINING	COURSE AND SPONSOR	PLACE ACCOMPLISHED	COMPLETED		*ROLE
				Month	Year	
A.	WATER SURVIVAL: 1. MAINTENANCE SWIM					
	2. DILBERT DUNKER					
	3. PARACHUTE DRAG					
	4. IMMERSED COCKPIT					
	5. IMMERSED SEAT					
B.	JUNGLE SURVIVAL					
C.	ARCTIC SURVIVAL					
D.	DESERT SURVIVAL					
E.	MOUNTAIN SURVIVAL					
F.	SURVIVAL (GENERAL)					

2. CONDITIONS PREVAILING AT SURVIVAL/RESCUE SITE *(If widely variable, give range)*

A. WATER TEMPERATURE ________ °F
B. AIR TEMPERATURE ________ °F
C. SURFACE WINDS ________ KNOTS
D. WAVE HEIGHT ________ FEET
E. WAVE FREQUENCY ________ PER MIN.

F. TERRAIN

☐ 1. OPEN GROUND
☐ 2. WOODS/JUNGLE
☐ 3. MOUNTAINS
☐ 4. DESERT
☐ 5. WATER
☐ 6. ICE/SNOW
☐ 7. SWAMP
☐ 8. OTHER
☐ 9. UNKNOWN

G. WEATHER

☐ 1. CLEAR
☐ 2. OVERCAST
☐ 3. FOG
☐ 4. RAIN
☐ 5. SNOW
☐ 6. SLEET
☐ 7. HAIL
☐ 8. OTHER
☐ 9. UNKNOWN

3. TIME LAPSE SEQUENCE FOR RESCUE EVENTS *(Give time lapse in hours and minutes from time of mishap)*

For actual rescue vehicle and personnel and others who took an active part in the rescue sequence but did not actually recover this individual. See Instructions for details.

	ACTUAL	OTHER ASSIST	OTHER ASSIST	LIGHT CONDITIONS			
				Day	Night	Dawn	Dusk
A. RESCUE PERSONNEL NOTIFIED THAT MISHAP HAD OCCURRED							
B. RESCUE VEHICLE DEPARTED							
C. THIS INDIVIDUAL LOCATED BY RESCUE PERSONNEL							
D. THIS INDIVIDUAL PHYSICALLY REACHED BY RESCUE VEHICLE PERSONNEL							
E. THIS INDIVIDUAL ACTUALLY ABOARD RESCUE VEHICLE OR RESCUE ATTEMPT ABANDONED							
F. RESCUE COMPLETED (PERSON RETURNED TO STATION, HOSPITAL, ETC.)							

4. A. TIME THIS INDIVIDUAL SPENT IN WATER ________ HRS. ________ MIN. B. TIME THIS INDIVIDUAL SPENT IN LIFE RAFT ________ HRS. ________ MIN.

5. AT TIME OF RESCUE ALERT, DISTANCE IN MILES FROM MISHAP SITE TO:

A. ACTUAL RESCUE VEHICLE ________ . B. NEAREST ASSIST RESCUE VEHICLE ________

6. PERSONNEL/VEHICLES PARTICIPATING IN RESCUE

A. VEHICLE PERFORMING ACTUAL PICKUP OF THIS PERSON

1. TYPE/MODEL: ________ 2. LOCATION WHEN ALERTED ________ 3. DUTY WHEN ALERTED ________

B. DID RESCUE PERSONNEL LEAVE VEHICLE TO ASSIST IN RESCUE? ☐ 1. YES ☐ 2. NO ☐ 9. UNKNOWN

IF SO, HOW?

☐ A. PARACHUTED
☐ B. JUMPED WITHOUT PARACHUTE
☐ C. DESCENDED LINE/LADDER/NET
☐ D. LOWERED BY HOIST
☐ E. NORMAL GROUND/WATER
☐ Y. OTHER

C. LIST OTHER VEHICLES PARTICIPATING IN RESCUE EFFORT: (OTHER ASSISTS IN ITEM 3) ________

OTHERS WHO STOOD BY READY TO RENDER ASSISTANCE IF REQUIRED: ________

D. NUMBER SEARCH AND RESCUE HOURS ________

CONTINUED ON REVERSE SIDE

NAME	SERIAL NO.	A/C	BUNO

7. RESCUE EQUIPMENT USED *(Use numbers to show sequence)*

- [ ] A - SLING
- [ ] B - SEAT
- [ ] C - CARGO NET
- [ ] D - ROPE
- [ ] E - LIFE RING
- [ ] F - BASKET
- [ ] G - BOOM NET
- [ ] H - DAVIT
- [ ] J - RAFT
- [ ] K - WEBBING CUTTERS
- [ ] L - CHICAGO GRIP
- [ ] M - GRAPNEL
- [ ] N - BOARDING LADDER
- [ ] P - KNIFE/AXE/SAW
- [ ] Q - MAKESHIFT CARRIER/SUPPORT
- [ ] R - FIRST AID EQUIPMENT
- [ ] S - TREE PENETRATOR SEAT
- [ ] T - HELICOPTER PLATFORM
- [ ] U - STRETCHER
- [ ] V - CABLE CUTTERS
- [ ] W - HELICOPTER RESCUE BOOM
- [ ] X - BILLY PUGH NET ______
- [ ] Y - OTHER (DESCRIBE) ______

8. RESCUE ALERTING MEANS *(Use numbers to show sequence)*

- [ ] A - WITNESSED
- [ ] B - RADAR SURVEILLANCE
- [ ] C - OVERDUE REPORT TO SAR
- [ ] D - AIRBORNE RAPID RELAY
- [ ] E - CRASH PHONE
- [ ] F - OTHER TELEPHONE
- [ ] G - RADIO MAY-DAY CALL
- [ ] H - RADIO SURVIVAL TYPE
- [ ] J - OTHER RADIO REPORT
- [ ] K - VISUAL SIGNALLING EQUIPMENT
- [ ] L - AUDIO SIGNALLING EQUIPMENT
- [ ] M - SURVIVOR REPORT
- [ ] N - LOSS OF RADIO CONTACT
- [ ] P - SMOKE/FIRE–CRASH SCENE
- [ ] Y - OTHER (DESCRIBE) ______

9. ALERTING/COMMUNICATIONS PROBLEMS

- [ ] A - POOR RADIO RECEPTION
- [ ] B - TELEPHONE LINE BUSY
- [ ] C - POOR RADIO DISCIPLINE
- [ ] D - AIRCRAFT RADIO/IFF EQUIPMENT INOPERATIVE
- [ ] E - POOR RADIO PROCEDURES
- [ ] Y - OTHER ______

10. DELAYS IN DEPARTURE OF RESCUE VEHICLES

- [ ] A - VEHICLE OPERATOR NOT AVAILABLE
- [ ] B - VEHICLE NOT READY
- [ ] C - VEHICLE CREW NOT AVAILABLE
- [ ] D - COMMUNICATIONS BREAKDOWN
- [ ] E - COMPLETING PREVIOUSLY ASSIGNED DUTIES
- [ ] F - LACK OF INFORMATION ON CRASH SITE
- [ ] G - NATURE OF TERRAIN
- [ ] H - WEATHER
- [ ] Y - OTHER ______

11. RESCUE VEHICLE PROBLEMS ENROUTE

- [ ] A - HEADWIND
- [ ] B - POOR VISIBILITY
- [ ] C - HIGH SEA STATE
- [ ] D - MECHANICAL PROBLEMS
- [ ] E - NATURE OF TERRAIN
- [ ] F - OTHER OBSTRUCTIONS (FENCES, ETC.)
- [ ] G - RESCUERS LOST
- [ ] H - WEATHER
- [ ] Y - OTHER ______

12. PROBLEMS IN LOCATING INDIVIDUAL (OR KEEPING IN SIGHT)

- [ ] A - HEAVY SEAS
- [ ] B - TREES
- [ ] C - FOG/CLOUDS
- [ ] D - PRECIPITATION
- [ ] E - DARKNESS
- [ ] F - RADIO INTERFERENCE
- [ ] G - CONFUSION DUE TO OTHER LIGHTS
- [ ] H - MALFUNCTION OF DIRECTIONAL EQUIPMENT
- [ ] J - LACK OF CORRECT INFORMATION ON LOCATION OF SURVIVOR
- [ ] K - INABILITY TO VISUALLY DISTINGUISH SURVIVOR FROM TERRAIN
- [ ] L - LOSS OF RADIO/RADAR CONTACT
- [ ] M - SURVIVOR'S FAILURE TO USE SIGNALLING EQUIPMENT
- [ ] Y - OTHER ______

13. LOCATOR MEANS

Consult Instructions for listing of specific locator means and enter under appropriate categories. Use numbers to indicate sequence of observance.

GENERAL	PYROTECHNICS	ELECTRONIC SIGNAL DEVICES	BALLISTICS	AUDITORY	VISUAL

CONTINUED ON NEXT PAGE

14. SURVIVAL PROBLEMS ENCOUNTERED BY THIS PERSON

- [ ] Ø1 - INADEQUATE FLOTATION GEAR
- [ ] Ø2 - INADEQUATE COLD WEATHER GEAR
- [ ] Ø3 - LACK OF SIGNALLING EQUIPMENT
- [ ] Ø4 - LACK OF OTHER EQUIPMENT
- [ ] Ø5 - ENTANGLEMENT (PARACHUTE)
- [ ] Ø6 - DRAGGING (PARACHUTE)
- [ ] Ø7 - PARACHUTE HARDWARE PROBLEM
- [ ] Ø8 - ENTRAPMENT IN AIRCRAFT
- [ ] 98 - OTHER ____________
- [ ] Ø9 - PULLED DOWN BY SINKING PARACHUTE
- [ ] 1Ø - ENTANGLEMENT (OTHER THAN PARACHUTE)
- [ ] 11 - UNFAMILIAR WITH PROCEDURES/EQUIPMENT
- [ ] 12 - CONFUSED, DAZED, DISORIENTED
- [ ] 13 - INCAPACITATED BY INJURY
- [ ] 14 - POOR PHYSICAL CONDITION
- [ ] 15 - EXPOSURE (HEAT, COLD, SUNBURN, ETC.)
- [ ] 16 - FATIGUE
- [ ] 17 - WEATHER
- [ ] 18 - TOPOGRAPHY (SWAMPS, MOUNTAINS, DESERTS, ETC.)
- [ ] 19 - DARKNESS
- [ ] 2Ø - THROWN OUT OF RAFT
- [ ] 21 - HAMPERED BY HELO DOWNWASH
- [ ] 22 - PROBLEM BOARDING RESCUE VEHICLE
- [ ] 23 - THIRST
- [ ] 24 - HUNGER
- [ ] 25 - INSECTS, SNAKES, ANIMALS, ETC.
- [ ] 26 - SHARKS

15. PROBLEMS THAT COMPLICATED RESCUE OPERATIONS

- [ ] Ø1 - FAILURE OF RESCUE VEHICLE (MECHANICAL PROBLEMS)
- [ ] Ø2 - INADEQUACY/LACK OF RESCUE VEHICLE
- [ ] Ø3 - FAILURE OF RESCUE EQUIPMENT (HOIST, ETC.)
- [ ] Ø4 - INADEQUACY/LACK OF RESCUE EQUIPMENT
- [ ] Ø5 - INADEQUACY OF RESCUE PERSONNEL KNOWLEDGE/TRAINING
- [ ] Ø6 - INADEQUATE MEDICAL EQUIPMENT
- [ ] Ø7 - INADEQUATE MEDICAL FACILITIES
- [ ] Ø8 - VEHICLE OPERATOR FACTOR (POOR PROCEDURE)
- [ ] Ø9 - RESCUE CREWMAN ASSIST HESITANCY
- [ ] 1Ø - FIRE/EXPLOSION
- [ ] 11 - ENTRAPMENT IN AIRCRAFT
- [ ] 12 - PHYSICAL LIMITATIONS OF RESCUE PERSONNEL
- [ ] 13 - PHYSICAL LIMITATIONS OF PERSON BEING RESCUED
- [ ] 14 - CARELESSNESS OF RESCUE PERSONNEL
- [ ] 98 - OTHER ____________
- [ ] 15 - PANIC/INAPPROPRIATE ACTIONS OF PERSON BEING RESCUED
- [ ] 16 - RESCUE VEHICLE ACCIDENT
- [ ] 17 - COMMUNICATIONS PROBLEMS
- [ ] 18 - DRAG/ENTANGLEMENT BY DEPLOYED PARACHUTE
- [ ] 19 - TOPOGRAPHY (ROUGH SEAS, MOUNTAINS, ETC.)
- [ ] 2Ø - INTERFERENCE FROM OTHER VEHICLES
- [ ] 21 - VICTIM PULLED AWAY BY EXTERNAL FORCES
- [ ] 22 - WEATHER
- [ ] 23 - DARKNESS
- [ ] 24 - WEIGHT/DRAG PROBLEM NOT DUE TO PARACHUTE
- [ ] 25 - HAMPERED BY PERSONNEL/SURVIVAL EQUIPMENT OF PERSON BEING RESCUED
- [ ] 26 - FLOATING DEBRIS
- [ ] 27 - PRIMARY RESCUER DELAYED AWAITING FUTILE ATTEMPTS BY OTHER RESCUERS
- [ ] 28 - HAMPERED BY HELICOPTER DOWNWASH

16. INDIVIDUAL'S PHYSICAL CONDITION

	DURING RESCUE	AFTER RESCUE
1. FULLY ABLE TO ASSIST	1 -	A -
2. PARTIALLY ABLE TO ASSIST	2 -	B -
3. IMMOBILE OR UNCONSCIOUS	3 -	C -
4. FATAL ON RECOVERY-DUE TO INJURIES		D -
5. FATAL ON RECOVERY-DROWNED		E -
6. RECOVERED ALIVE-DIED FROM INJURIES		F -
7. LOST DURING RESCUE ATTEMPT-PRESUMED DROWNED		G -
8. LOST DURING RESCUE ATTEMPT-APPARENTLY INJURED OR DROWNED		H -

17. CHECK CATEGORY OF FACTORS THAT HELPED RESCUE/RECOVERY (FROM RESCUER POINT OF VIEW)

- [ ] 1 - RESCUE PERSONNEL TRAINING
- [ ] 2 - TRAINING OF PERSON TO BE RESCUED
- [ ] 3 - KNOWLEDGE OF AIRCRAFT EMERGENCY ESCAPE MEANS
- [ ] 4 - KNOWLEDGE OF PERSONNEL EQUIPMENT RELEASES/ACTUATORS
- [ ] 5 - RESCUE PROCEDURES/PRE-ACCIDENT PLANS
- [ ] 6 - AVAILABILITY OF RESCUE EQUIPMENT
- [ ] 7 - SUITABILITY OF RESCUE EQUIPMENT
- [ ] 8 - SURVIVOR'S TECHNIQUES
- [ ] 9 - COORDINATION OF RESCUE EFFORTS

NAME	SERIAL NO.	A/C	BUNO

MEDICAL OFFICER'S REPORT OF A/C ACCIDENT, INCIDENT OR GROUND ACCIDENT
FLIGHT SURGEON'S COMMENTS, ANALYSIS AND RECOMMENDATIONS

OPNAV FORM 3750/8I (REV. 4-68) S/N 0107-731-8900

REPORT SYMBOL 3750-7

See Section H of OPNAVINST 3750.6

FLIGHT SURGEON PARTICIPATED FULLY IN INVESTIGATION	NO. OF HOURS SPENT	DATE OF REPORT
☐ YES ☐ NO		
FLIGHT SURGEON PARTICIPATED FULLY IN BOARD PROCEEDINGS	NO. OF HOURS SPENT	NO. REPORTS PREPARED
☐ YES ☐ NO		

FLIGHT SURGEON'S NAME AND GRADE	DUTY STATION	SIGNATURE

Flight Surgeon's NEWSLETTER

(This material is for the information of commanding officers, aerospace physiologists and psychologists and Navy flight surgeons and does not necessarily reflect endorsement by the Department of the Navy or the Naval Safety Center.)

FSNL - 2nd Quarter 1969

MORE PRESSURE TO PUBLISH

The thoughts on the merits of publishing as related to the medical teacher expressed in the letter reprinted from the New England Journal of Medicine on the following page are certainly well put and are concurred in by this editor. It is brought up here as an introduction to the problem of professional writing for operational aeromedical personnel.

A flight surgeon, aviation physiologist or psychologist can spend almost his entire career in operational billets and at support stations and thus find little impetus for writing in his chosen profession. Even the years in residency or P.G. training may not afford the opportunity to produce a paper worthy of journal publication. What then can be his outlet? Why not write for the Flight Surgeon's Newsletter? Send us those lectures on medical and aeromedical subjects that you present to aviators. Write up interesting or problem cases in aviation medicine, physiology and human factors related to safety. We are anxious to publish such material which will contribute to the overall safety effort and the exchange of life sciences information. Of course we include your byline, and although we don't class ourselves with the professional journals, you will be publishing a "competent... arranged and literate report." Besides, the practice might encourage you to write for the journals.

Frank H. Austin, Jr.

FRANK H. AUSTIN, JR.
CAPT, MC, USN

TO PUBLISH OR TO PIPE?

To the Editor: Publish or perish! The impact of these catchwords derives from their past applicability as a requirement for academic advancement. Like those of similar slogans, its origins are unclear. Its use in modern times may have started locally in the middle '30's at the time when President Conant, of Harvard, upgraded the scholarship base at the University by insisting on productivity in distinction, or in addition, to mere teaching ability.

But times are changing, and a cry has gone abroad that we need more people to focus on teaching alone. This has arisen from several causes; the nondiscriminating nature of the insistence on a long bibliography as a requirement for faculty promotion, so well lampooned by Irving[1] years ago; the need for a greater number of gifted teachers who can devote to their students time unencumbered by a load of laboratory or lecture-tour responsibilities[2]; and the shrinking of federal funds for laboratory research, which will inevitably decrease the future flow of publications.

Dunphy[3] has recently recommended that the nonpublishing teacher be given full recognition. But what are promotion boards to do to resolve competition between faculty members for pre-eminence primarily as teachers? Centuries ago a mysterious stranger in pied clothing bewitched the children of Hameln with his pipes. Shall we run a teacher popularity poll among the students — whose ears are ever tuned to the music of a strong personality? Shall we promote on the basis of whose elective course is the most sought after? One can even visualize free coffee and nubile secretaries creeping into the equation.

The boards know what they want, but are perplexed over how to achieve it. Surely, the only answer still is to insist on a publications list that, however short, is of high quality and not necessarily based on laboratory work. If a medical school is to be worth its salt each faculty leader must make an extracurricular effort in some special aspect of his area of competence and be able to tell people of his work in an arranged and literate report. This at the least is what is meant by being productive. The man with professional aspirations who has no significant publications must remain labeled either as a nonproducer or as an offbeat nonjoiner.

If we break faith with those who have with such labor introduced scholarship as a sine qua non for medical teaching we may, as the citizens of Hameln did when they broke faith with the Pied Piper, lose a young generation into oblivion.

RICHARD WARREN, M.D.
Director
Department of Surgery
Cambridge Hospital

Cambridge, Mass.

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1. Irving, F. C. Aesculapius inspects Harvard Medical School. Address delivered at the Mid-Winter Dinner of the Aesculapian Club, January 11, 1947.
2. Ebert, R. H. Role of medical school in planning health-care system. *J. M. Educ.* **42**:481-488 (June), 1967.
3. Dunphy, J. E. Not from curriculum. *Harvard Alumni Bull.*, summer, 1968, p. 13 (also, *Am. J. Surg.* **116**:408, September, 1968).

The letter above appeared in the New England Journal of Medicine, 280:3, 16 January 1969. It is reprinted here with the permission of both the author and the Journal.

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MEDICATION AND AIR TRAFFIC CONTROL

Following is the text of United Kingdom Aeronautical Information Circular 72/68, issued by the Board of Trade Civil Aviation Department. Philosophy of this nature transcends international boundaries and differences in word usage. OPNAVINST 3710.7D Change 3 (General NATOPS) has been issued. It has some new regulations concerning self-medication and medication by flight surgeons of aviation personnel. Excerpts from Change 3 appear elsewhere in this issue.

MEDICATION AND AIR TRAFFIC CONTROL

Many flying accidents and incidents have occurred as a result of pilots flying whilst medically unfit, and we can here draw a parallel in Air Traffic Control. It is reasonable to infer that incidents such as "near misses" or periods of reduced efficiency could be ascribed to ill-health and its treatment. Although common ailments such as colds, sore throats, abdominal pain and diarrhoea may cause relatively unimportant discomfort or hazard in the normal course of events, they can be dangerous when associated with air traffic control, and the more exacting the task the more likely are minor indispositions to be serious. The ideal situation would be that anyone requiring medication for the treatment of illness should not carry out air traffic control duties, but this is not always practicable. The illness may be relatively mild and not seriously affect the performance of these duties and the medication needed may not conflict with the standard of fitness required. However, since many common drugs and remedies have powerful side effects, all Air Traffic Control personnel should know how these may affect their work performance. The response to drugs is a very personal matter and although there is an average response, it can vary widely from person to person.

Any form of medication whether prescribed by a doctor or purchased over the counter, and particularly if being taken for the first time, may have serious consequences in the aviation environment unless three basic questions can be satisfactorily answered:

(1) Do I feel fit for work?

(2) Must I take medicines at all?

(3) Have I given this particular medication a personal trial for at least 24 hours before going on duty to ensure that it will not have any adverse effects on my ability to work?

Confirming the absence of adverse effects may need expert advice and General Practitioners experienced in aviation matters, Medical Examiners authorised by the Board of Trade both in the United Kingdom and overseas, Royal Air Force Medical Officers, Company Medical Officers and the Medical Branch of the Board of Trade are all available to assist in this matter.

(Continued)

The following are some of the types of medicines in common use which may impair work performance.

(i) Sleeping tablets -- these dull the senses, cause mental confusion and slow reaction times. The duration of effect is variable from person to person and may be unduly prolonged. Controllers should have expert medical advice before using them.

(ii) Fear is normal and provides a very effective alerting system, enhancing the arousal state. Many tranquilisers and sedatives depress this alerting system and have been a contributory cause of fatal accidents. You should not, therefore, work when taking them.

(iii) Antibiotics (penicillin and the various -mycins and -cyclines) and sulpha drugs may have short-term or delayed effects which affect work performance. Their use indicates that a fairly severe infection must be present and, apart from the effects of these substances themselves, the side-effects of the infection will almost always render a controller unfit for work.

(iv) Anti-histamine drugs are widely used in "cold cures," and in the treatment of hay fever, asthma and allergic skin conditions. Many easily obtainable nasal spray and drop preparations contain anti-histamines. Most, if not all, of this group of medicines tend to make you feel drowsy. Their effect combined with that of the condition, will often prevent you from answering the basic three questions satisfactorily. Admittedly very mild states of hay fever, etc., may be adequately controlled by small doses of anti-allergic drugs, but a trial period to establish the absence of side-effects is essential before going on duty. When controllers are affected by allergic conditions which require more than the absolute minimum of treatment, and in all cases of asthma, one of the above mentioned sources of advice should be consulted.

(v) "Pep" pills (e.g. containing Caffeine, Dexedrine, Benzedrine) used to maintain wakefulness are often habit forming. Susceptibility to each drug varies from one individual to another but all of them can create dangerous overconfidence. Overdosage may cause headaches, dizziness and mental disturbances. The use of "pep" pills whilst working cannot be permitted. If coffee is insufficient, you are not fit for work.

(Continued)

(vi) Drugs for the relief of high blood pressure cause a change in the mechanism of blood circulation which can be hazardous. If the blood pressure is such that drugs are needed a controller is probably not fit for work, but this will be determined by the type of drug which is being taken. If in any doubt about your blood pressure do not hesitate to seek advice.

(vii) Anti-malarial drugs in normally recommended doses do not usually have any adverse effects. However, ensure that the drug is taken in good time so that Question 3 above can be satisfactorily answered.

Although these are common groups of drugs which may have adverse effects on performance it should be pointed out that many forms of medication, which although not usually expected to affect efficiency, may do so if the person concerned is unduly sensitive to the particular drug. You are therefore urged not to take any drugs or medicines before or during duty unless you are completely familiar with the effects of the medication on yourself. Again, the medical sources of advice mentioned earlier in this Circular should be consulted in cases of doubt.

Alcohol has similar effects to tranquillisers and sleeping tablets, and may remain circulating in the blood for a considerable time, especially if taken with food. It should be borne in mind that you may not be fit to go on duty even eight hours after drinking large amounts of alcohol. Special note should be taken of the fact that alcohol and sleeping tablets or anti-histamines can form a highly dangerous and even lethal combination.

Remember that, following local and general dental and other anaesthetics, a period of time should elapse before returning to duty. This period will vary depending on individual circumstances, but may even extend up to 24 or 48 hours. Any doubts should be resolved by seeking appropriate medical advice.

To sum up, the effects of medication on work performance are the direct concern of the individual. This Circular gives some guidance, but it cannot be comprehensive. If in doubt consult the medical sources mentioned for advice, and should there be any difficulty in obtaining it, contact the Board of Trade at this number: 01-836 1207, Extension 493, when the Medical Branch will be glad to give you all possible assistance.

This Circular is issued for information, guidance and necessary action.

By direction of the Board of Trade,

Antony Part.

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FATIGUE CONTRIBUTING FACTOR IN MIDAIR COLLISION

The following thoughtful MOR "Conclusions and Recommendations" on a midair collision was written by the investigating flight surgeon, LT Joel B. Lench, MC.

"The major factor in this accident, as in most mid-air collisions, was pilot error. However, I feel that there was a strong mitigating factor in this case, which must be taken into consideration. I choose to call this factor, for lack of a better term, subclinical pilot fatigue. It is an insidious and dangerous disease. It is not detectable by any currently available physical or mental tests. It cannot be proved or disproved by simply listing the number of hours slept, meals eaten, or free time available for recreation. Unfortunately, it shows itself only when an accident occurs in which pilot error is involved.

"To substantiate my premise let us look at the amount of flying done by the two aviators beginning with the start of our fifth line period up until, and including the day of the accident; a period of 12 days. LT 'X' briefed and flew 14 combat missions, briefed and manned an aircraft for 8 spares which never launched and spent one day as the squadron duty officer. LTJG 'Y' briefed and flew 15 combat missions, briefed and manned an aircraft for 7 spares and spent one day as the squadron duty officer. When you take into account that briefing, flying, and debriefing a combat mission requires between four and five hours of intense concentration and even just briefing and manning an aircraft as a spare requires two hours of similar mental exertion, it is readily apparent that both of these pilots were good candidates for subclinical pilot fatigue. It is true that this fatigue is often indefinable and manifests itself in vague and subtle ways -- a fraction of a second longer reaction time, an extra moment before making a decision or a minor error in judgment -- but in combat carrier aviation, there is no room for error of any magnitude.

"The obvious solution would be to prevent this fatigue by having the pilots fly less missions. However, our operational commitments in the combat zone preclude this alternative. Thus, in order to carry out our assigned mission, we can do nothing except acknowledge and emphasize to the pilots the existence of this nebulous fatigue factor expecting, and regretfully accepting its distressing yet inevitable consequences."

(Continued)

In its recommendations the board stated, "While the factors that may induce pilot fatigue are fairly well known, there is no readily available way of determining the boundary level at which a pilot is judged to be unduly fatigued and thus unsafe to fly. This level will vary between individuals and is difficult to discern by an outside observer since it can be easily disguised by a highly motivated and competitive pilot. Common sense dictates that each aviator admit when that point has been reached. All too often personal pride will prevent him from doing so, especially in a combat environment. To ask to be left off the flight schedule because of fatigue leads one to feel he is either shirking his duty or is causing his 'buddy' to be unduly exposed to danger in his place. As a result pilots are extremely hesitant to admit to fatigue and will not do so as long as combat operations dictate the flight requirements. To aid in alleviating the fatigue aspect it is, therefore recommended that: (1) Regular stand-downs from heavy combat flight operations be scheduled and that such stand-downs occur once weekly and be of 24 hours' duration. (2) All pilots be encouraged to admit to fatigue when their personal level has been reached and (3) A program be instituted within the squadron to relieve pilots of flying and normal ground duties for 24 hour rest periods during prolonged (eight or more days) combat operations when stand-downs are not possible."

Immediately following the accident, steps were taken to alleviate the fatigue factor by adjusting the flight schedule to permit four of the 24 pilots assigned to have a non-flying day every day, the first endorser to the investigation report stated. The number of daily sorties was such that each pilot was thus ensured a day of rest every fifth day without materially increasing the load on the remaining pilots. Subsequent endorsers concurred.

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ABBREVIATED MOR

The new Abbreviated MOR (see FSNL--4th Quarter 1968, article on page one) is at the printer's and should be distributed before the next issue of Flight Surgeon's Newsletter! It will be implemented by an OPNAV Notice and initial distribution of one pad (20 copies) will be made direct to Commands.

The form consists of a single page (Form 3750/8J) on which we have combined items from five sections of the standard MOR and may be used in lieu of Forms 8B through 8I in reporting those mishaps where <u>no aeromedical factors</u> were involved. Note that Form 8J for each qualified individual must accompany 8A which is submitted for each mishap.

Criteria for its use are printed on the reverse side of the form and instructions for completion are contained in the OPNAV Notice. Please follow the instructions to the letter and your workload will be greatly reduced.

PHYSICAL AND PSYCHOLOGICAL FITNESS OF FLYING PERSONNEL

Reprinted herewith is Section 820, Chapter VIII, OPNAVINST 3710.7D Change 3, the long-awaited Natops section on physical and psychological fitness of flying personnel:

820 PHYSICAL AND PSYCHOLOGICAL FITNESS OF FLYING PERSONNEL

a. General Background. Operational effectiveness and aviation safety are enhanced by assuring that all aircrew personnel are fit to fly. Conversely, conditions which tend to reduce peak physical and psychological functioning can contribute significantly to decrements in performance and increase the chance of accident. It is the intention of this section to outline basic guidelines which Commanding Officers, Flight Surgeons, aviators and other aircrewmen can utilize in monitoring fitness of all personnel for flight.

b. Factors Affecting Aircrew Fitness. Various factors come into play during flying, performance of ground duties, and off duty periods which may work against maintaining an ideal physical state. These factors must be understood by all concerned and appropriate countermeasures taken to assure that they do not depreciate aircrew fitness prior to or during flying and that individuals, if so affected, are temporarily grounded until again fit to fly.

(1) Rest and Sleep. Eight hours of sleep is the generally accepted requirement in every 24 hour period. Flight personnel should not normally be scheduled for continuous alert and/or flight duty (required awake) in an excess of 18 hours and, if so assigned, a crew rest period of 15 hours minimum thereafter should be provided. Flight schedules should be made with due consideration for watch-standing, collateral duties, training, and off-duty activities.

(2) Flying Time.

(a) Precise delineation of aircrew flight time limitations is impractical in view of the varied conditions encountered in flight operations. Required pre- and post-flight crew duty time must be given due consideration. The following guidelines are provided to assist Commanding Officers in ensuring that flying safety is maximized consistent with operational efficiency.

1. Daily flying should not normally exceed two flights or six and one half hours pilot time for pilots of single piloted aircraft. Individual flying time for pilots of other aircraft should not normally exceed three flights or 12 hours. These limitations assume an average requirement of 4 hours ground time for briefing and debriefing.

2. Weekly maximum pilot time for pilots of single piloted aircraft should not normally exceed 30 hours. Total individual flying time for each aviator of other aircraft should not exceed 50 hours. When practicable, aircrews should not be assigned flight duties on more than 6 consecutive days.

3. Accumulated individual flying time should not exceed the number of hours indicated in the following table:

Period (Days)	Single-piloted aircraft	Multi-piloted non-pressurized aircraft	Multi-piloted pressurized aircraft
30	90	125	150
90	240	330	400
365	850	1200	1400

4. When the tempo of operations require that the flying time limitations delineated in subparagraph 3. be exceeded, aviators should be monitored and specifically cleared by the Commanding Officer, on the advice of the Flight Surgeon. In meeting operational needs, Commanding Officers should assure equitable distribution of flying time commitments among assigned aviators, commensurate with such additional ground duties that each may be assigned.

(3) Diet. Diet should be adjusted to avoid the development of obesity. Reducing diets shall be under the strict supervision of the Flight Surgeon.

(4) Exercise. Some form of planned physical acitivity tends to promote fitness and vigor. When full aircrew complements are essential, due consideration must be given to avoiding sports which bear a high risk of disabling injury (contact sports, skiing, etc.). Adequate rest periods must be provided for aviators before flying following participation in competitive or particularly tiring sports activity. Twelve hours should normally be adequate if no injuries are sustained.

(5) Overindulgence. It is basically the responsibility of an aviator himself to report any physical indisposition to his superiors, and to assume flight duty only when he is fit to do so. However, since an individual may frequently be the poorest judge of his own fitness, others (Commanding Officer, Flight Surgeon, Safety Officer, Schedules Officer, etc.) shall ensure that flight crew personnel are adequately observed, and that appropriate temporary grounding action is taken when necessary.

(a) Alcohol. Normally no aviator should assume control of aircraft within 12 hours of last consuming alcohol. Flying with any level of blood alcohol is dangerous, and in addition, the depression and "hangover" following drinking can result in increased accident potential. Due consideration should be given to these multiple variant factors when scheduling flight and maintenance operations.

(b) Smoking. Heavy smoking prior to and during flight should be discouraged, since moderate concentrations of blood carbon monoxide are attained. Aviation personnel (and others) should be indoctrinated concerning the many health hazards of smoking, and encouraged to stop or reduce indulgence.

(6) Minor Physical Illness. The effects of acute disease such as colds, digestive upset and diarrhea, can produce serious impairment of flying personnel. Such illnesses (including vague feelings of fatigue or distress) should be reported to the Flight Surgeon for evaluation prior to flight. Grounded personnel shall not return to flight status until clearance has been recommended by the Flight Surgeon and approved by the Commanding Officer or his representative. Grounding Notice (NAVMED 1380) and Clearance Notice

(NAVMED 1381) shall be utilized in accordance with the Manual of the Medical Department in all cases where flying personnel are grounded for medical reasons.

(7) Emotional Upset. Aviators must be honest with themselves concerning motivation, confidence, fears, capabilities, and primary concerns. They should seek the guidance of their more mature leaders or the counsel of the Flight Surgeon when emotional disturbance or fatigue appear to interfere with their flight functions. The Commanding Officer must remain alert to the emotional and physical status of his assigned personnel and take such corrective action as may be necessary for individuals, or that may be indicated for particular groups (e.g. short stand-down from combat flight, rest and recreation, leave, etc.)

(8) Immunization, Drugs, Blood Donations, and Medication.

(a) Immunization. As a general rule, flying personnel should be grounded for 12 hours following an inoculation. Those showing protracted or delayed reaction should be grounded until cleared by the Flight Surgeon.

(b) Medication. Self medication by aircrew personnel is strongly discouraged. Almost any drug or "pill" can at times produce untoward reaction or impair the coordination and concentration required in flight. Within 12 hours prior to flight, aviators should take no medication unless approved or prescribed by the Flight Surgeon. Flight Surgeons shall indicate necessary flight limitations on all prescriptions provided to flying personnel. Medicines such as antihistamines, antibiotics, tranquilizers, sleeping pills, etc., obtained during an acute illness should be discarded if not all used during the period of medication. Sustained medication should be strictly supervised by the Flight Surgeon who shall make appropriate health record entries.

(c) Drugs. The use of drugs such as marijuana, LSD and other hallucinogens by aircrew personnel is prohibited.

(d) Blood donation. Although blood donated in small quantities is quickly replaced and does not adversely affect ground activities, the hazards of hypoxia and reduced barometric pressure make it desirable to limit such donations by flying personnel in accordance with the following:

1. Flying personnel shall not be regular blood donors.

2. Flying personnel in combat or flying from aircraft carriers shall not donate blood within 4 weeks prior to such flying.

3. Flying personnel shall not participate in flight duties or perform low pressure chamber "runs", for 4 days following donation of 500 cc of blood.

(9) Pressure Chambers and Scuba.

(a) Pressure Chambers. There are no restrictions to flight following low pressure chamber runs unless:

1. Explosive decompression is experienced in other than a full pressure suit.

2. Exposure exceeds an equivalent of 40,000 feet.

3. An individual has suffered a reaction to decompression (vasomotor collapse, unconsciousness, bends, etc.). In such cases the subject shall be grounded, utilizing NAVMED Form

1380, and referred to a Flight Surgeon. Flight is not authorized until cleared by the Flight Surgeon and the individual's Commanding Officer.

(b) Scuba. Under normal circumstances personnel shall not fly or perform Low Pressure Chamber "runs" within 24 hours following scuba diving, compressed air dives, or high pressure chamber runs. Under circumstances where an urgent operational requirement dictates, flying personnel may fly within 12 hours of scuba diving, providing no symptoms of aeroembolism develop following surfacing and the subject is examined and cleared by a Flight Surgeon.

c. Physical Examination. Flight Surgeons shall keep flying personnel under surveillance to such a degree that physical illness, fatigue, or emotional upset will be readily detected. The Commanding Officer shall establish administrative provisions as necessary to assure that all aviators and other designated flying personnel report to the Flight Surgeon whenever their fitness to fly is questionable. In addition, the Flight Surgeon shall conduct interviews and/or physical examinations of flying personnel as follows:

(1) Annual Flight Physical Examination: in accordance with the Manual of the Medical Department.

(2) Check-in: upon reporting (including TAD for flying only) to a new unit or base.

(3) Post-grounding: following grounding for medical reasons.

(4) Post Hospitalization: following return to duty after any admission to the sick list or hospital (including medical boards). NAVMED 1380 shall be submitted for all admissions, and NAVMED 1381 submitted when flying personnel are returned to flight duty.

(5) Post Accident: following all aircraft accidents and an incident in which human factors are involved.

These examinations may be as cursory or as extensive as the individual Flight Surgeon may determine to be indicated by the situation or as dictated by the Manual of the Medical Department or OPNAVINST 3750.6 series. Notation of such examination shall be entered in the individual's health record and reported as required to the Commanding Officer and Bureau of Medicine and Surgery.

d. Summary. It is reemphasized that the monitoring, evaluation and control of fitness to fly is primarily the responsibility of, and can best be done by, the individual flying personnel involved. However, the Commanding Officer, Flight Surgeon, and his representatives shall assume supervisory cognizance in this vital area commensurate with its importance to operational effectiveness and flying safety.

The restraining guidelines listed above will be subject to wide interpretation and deviations in relation to the operational and combat commitment and individual pilot or aircrew variability. The Commanding Officer's experience and judgment must be the ultimate determinant in such ill-defined situations.

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ACCIDENTAL SKIN EXPOSURE TO CI-2 LIQUID: GET THE STUFF OFF QUICKLY!

In a previous issue of the Flight Surgeon's Newsletter (FSNL 2nd Quarter, 1968), we talked about the health hazards of CI-2 smoke abatement additive, a liquid injected into the fuel system of certain naval and Marine aircraft to eliminate tell-tale exhaust trails. This compound, known as CI-2 (combustion improver #2), is the complex chemical methyl-cyclopentadienyl-manganese-tri-carbonyl and is highly toxic. Overexposure due to excessive vapor inhalation or skin absorption can lead quickly to a form of manganese poisoning, affecting the central nervous system. Specific safety precautions were given in Interim NAVAIR Instruction AIR-536-1 (1 Apr 1968) and enclosure (1) of COMNAVAIRPAC Notice 4700 (29 Mar 1968). Recent human experiences regarding accidental skin exposure to CI-2 have come to our attention which are worth passing on to all flight surgeons.

Occupational Health Hazards Release #57 (BUMED Nov 1968) describes a contaminating incident involving a line from the CI-2 system containing a faulty check valve and fitting which was sent for repair to the maintenance shop. It was assumed that the tubing was dry; no hazard warning tag was affixed (as required by the local NAS Instruction). A small quantity of CI-2, estimated as 5 to 15 ml, spilled on the bare hands of the mechanic during disassembly of the parts. In 3 to 5 minutes he developed a "thick tongue," giddiness, nausea and headache. He reported to the dispensary not knowing the name or nature of the offending material. It required a half-hour to determine that he was suffering from the effects of CI-2. He was given oxygen and supportive therapy and observed in the dispensary until toxic symptoms disappeared. On the three following days he was seen and remained symptom free. The medical aide who handled the wet rag in which the disassembled parts were wrapped noted a metallic taste in his mouth within "minutes" after exposure. A critical safety factor in this case was lack of labeling of hazardous material.

Contrast this experience with the excellent precautionary scheme used by CAPT J. Gordon, MC, while he was senior medical officer on AMERICA. He briefed CI-2 handlers (squadron maintenance officers and enlisted types, and AMD people) on the hazards and designated two minutes as a maximum time after an inadvertent exposure in which to wash the material off and report to sick bay. The scheme recommends immediate wash of affected skin areas with JP-5 fuel on the flight deck followed as soon as possible by soap-and-water wash in sick bay. A doctor is called in each case and the skin surface area involved and time to JP-5 wash noted. Three minor spills occurred around mid-1968 and the whole plan worked very well with no apparent ill-effects noted.

Data on human over-exposure and effects from this chemical are sparse. The original strict precautions were based on toxicological experiments on animals. Experiences to date would indicate that Dr. Gordon's recommended scheme, including the two-minute time limitation in which to get the material completely off the skin, is not ultraconservative and should be followed by other activities.

(Continued)

Accidental Skin Exposure to CI-2 Liquid (Continued)

The Safety Center (Life Sciences Department) would welcome accounts of any experience with this compound which either document the foregoing or shed additional light on the subject. The NAVAIR group responsible for the CI-2 system indicated recently that they are actively pursuing a modified engine design in which virtually no smoke will be visible in the exhaust (without the use of poisonous additives). This would eliminate the problem entirely. However, until such time as this improved engine is developed and put into service, there is a continued need for strict adherence to established safety precautions in handling CI-2.

-John Maccioli
Industrial Hygienist

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ACUTE OVEREXPOSURE TO AVGAS VAPORS DUE TO SPILLS

The hazard from inhaling gasoline fumes is not simply defined since the mixture contains various toxic classes of hydrocarbons such as aliphatics, olefins, napthenics, aromatics, and in some cases other hazardous substances such as tetraethyl lead (a definite hazard in handling leaded gasoline sludge). An acute exposure to gas vapors will normally elicit symptoms and signs of intoxication described for heptane (an aliphatic hydrocarbon). The concentration and duration of exposure to elicit these responses will differ with the composition of the gasoline. Examples of human response at moderate to high concentrations are as follows:

CONCENTRATION	EXPOSURE TIME	RESPONSE
1,000 ppm (heptane)	6 minutes	Slight vertigo
5,000 ppm (heptane)	4 minutes	Marked vertigo, inability to walk straight line, hilarity, incoordination
10,000 ppm (gas)	10 minutes	Dizziness in four minutes, intoxication in 4 to 10 minutes ("gas jag")
10,000-15,000 ppm (gas)	30 minutes	Convulsions and death (proven in mice experiments)

(Continued)

Acute Overexposure to AvGas Vapors Due to Spills (Continued)

Calculations show that one ounce of gasoline spilled in a 1,000 cubic foot space (if no ventilation is present and the vapor is completely dissipated) would generate a concentration of roughly 150 ppm. A quart would generate roughly 5,000 ppm. According to the foregoing table, this latter and higher concentration would be considered an acute inhalation hazard, requiring the use of emergency type breathing apparatus.

To control (automatically) the gas concentration that develops from leaks requires good exhaust ventilation and other control measures (if available). A suggestion was made to the Naval Safety Center of installing random pattern baffles to minimize surface area of spilled fuel in gas handling spaces. This would probably help control the development of high lethal concentrations if spills were minimal. In the event of large spills or leaks this may be of limited value. The Safety Center has considered both this suggestion and a local suggestion involving a designed tapered deck draining into a well which is equipped with an eductor to automatically return spilled gas into a gas stores tank. These thoughts were discussed with ship design engineers and ships' operating personnel. Furthermore, AvGas pump rooms were visited to visualize the practicality of the suggested modifications. The consensus appears to be that, due to numerous penetrations in the deck, the pump room does not lend itself easily to the modifications suggested.

Relieving the atmosphere of high concentrations would result from good ventilation and immediate collection of gas "puddles." Ships have the capability of collecting small spills by ordinary methods and large spills by eductors. To prevent overexposure to personnel who enter the space in the presence of sizeable leaks or spills still would require personnel protection in the form of approved type of respirators. If the ventilation were sufficient to reduce the concentration to an atmosphere not immediately hazardous to life, an air-line respirator may be sufficient. Air-lines are not recommended for atmospheres immediately hazardous to life since the air-line may fail due to crimping, parting or compressor failure. In such an atmosphere respiratory equipment should take the form of self-contained breathing apparatus, hose mask (not normally available), or the air-line respirator with attached emergency air breathing bottle (now commercially available but not stocked in the Navy Supply System).

We are considering at this time the need for this latter type respirator for AvGas pump room and other similarly hazardous situations. Other necessary protective and preventive measures in AvGas pump room work are meticulous maintenance of piping, valves, and associated parts, and effective ventilation. Lack of effective ventilation in pump rooms is reportedly a problem area. The required ventilation for this area is an air change each four minutes or 1.5 CFM per each square foot of deck area. In a typical room having a volume of about 2,000 feet^3 this requires about 500 CFM of exhaust ventilation. This amount of ventilation should

(Continued)

Acute Overexposure to AvGas Vapors Due to Spills (Continued)

produce quite a noticeable draft at the exhaust ports. It is sound industrial health practice to have this ventilation checked occasionally (with appropriate meters) since the exhaust blower (on a separate system) may deteriorate and also because the system contains (for safety measure) a flame arrester which may prevent airflow due to obstruction with dust and dirt. Flame arresters are fitted with pressure gages (to sense Δp across the arrester) which will indicate restricted airflow and the need to clean or replace the arrester. Maintaining optimum overall ventilation will be of help in the emergency situation and also in control of light concentrations of gas vapors noted in the normal situation where no leaks or spills are apparent.

Proper maintenance, effective ventilation and proper respiratory protection are the protective and preventive measures which should be stressed at present.

- J. M.

* * *

USE OF BENZENE AND OTHER "POISONOUS" SOLVENTS

BUMED Instruction 6270.2 requires that requests for certain poisonous chemical solvents be reviewed and approved by the commanding officer or his delegated representative. Approval is to be given only if a safer substitute material is not available. The solvents listed are benzene (benzol), carbon tetrachloride and tetrachloroethane. The purpose of this requirement is to control the issue and usage of the more highly toxic chemicals since other suitable and safer materials are generally available to do the job. If approval is given to use these items, necessary precautions should be given to prevent untoward medical conditions from developing. The chemicals named can cause both acute and chronic injury (from breathing low concentrations of vapors over a period of time). Chronic benzene poisoning results from toxic action on the blood-forming tissues. Chronic carbon tetrachloride and tetrachloroethane poisoning results primarily from effects on the liver and kidneys. The listed chemicals can be absorbed also through the skin and benzene is extremely flammable and requires special precautions for fire-explosion prevention.

There are indications that some ships are procuring benzene for use in operations which do not warrant its use. A subsequent check on the use rate (demand history) of benzene was made by Naval Safety Center with the support of the Norfolk Naval Supply Center and Defense General Supply Center (CGS) Item Manager, Richmond, Va. Approximately 3000 gallons of benzene have been issued as a stock item through the Norfolk-Oakland Supply Centers during the 12-month period ending 1 Nov 1968. Several naval laboratories, which have an apparent need for this chemical, were queried and their combined estimated use rate totaled a small fraction of the stated quantity. This indicates that benzene is probably used excessively as an industrial solvent in ships and/or shore stations.

(Continued)

Use of Benzene and Other "Poisonous" Solvents (Continued)

Attention is called also to the fact that many commercial products contain benzene and carbon tetrachloride. The trade-name listing below is a partial listing of commercial products which contain large percentages of benzene and carbon tetrachloride. This list is included to indicate the seriousness of purchasing large quantities of trade-name items indiscriminately. Requisitions for chemicals should normally be made for stock items. If it is necessary to purchase a trade-name product, toxicity-safety data should be available on the product. Assistance is available on this from PMU's (Preventive Medicine Units); Medical and Safety Departments in shipyards and air stations; BUMED Codes 73/732; Chief of Naval Material Safety Office; and Naval Ship Engineering Center, Materials Development and Applications Office (Code 6101).

The following are a few suggested less hazardous substitute solvents for general cleaning and degreasing:

a. Soap/detergent and water (many jobs require no more)

b. Dry cleaning solvent, type II, high flash point (minimum 140° F). Fed. Spec. P-S 661b, stock numbers as follows:

6850-274-5421 (5 gallons)
-281-1986 (53 gallons)
-285-8011 (53 gallons)

c. Where non-flammable organic solvent is necessary (NOTE: these are moderately toxic and may require special precautions):

1-1-1 trichloroethane (methyl chloroform)
trichloroethylene
perchloroethylene

In summary, it is recommended that hazardous chemicals used and the adequacy of precautionary measures be reviewed. Items restricted in BUMED Instruction 6270.2 should not be used unless necessary and approved as required. Substitute solvents are suggested above. Assistance is available from offices named.

Partial Listing of "Trade-Name" Products Containing 50% or More Benzene and Carbon Tetrachloride

Trade Name	Carbon Tet	Benzene
Dr. Scat Typewriter Cleaner (10-10-64)	X	
Hancolite Glaze Cleaner		X
Hanco Special Type Wash		X
Adhesive GRB-12	X	
Adhesol	X	
All State Rubber Cement #1050		X
Asorbin	X	
Barco Spot Remover	X	X
Benol		X
Blanket and Roller Cleaner, KMC	X	X
Carbona	X	

Use of Benzene and Other "Poisonous" Solvents (Continued)

Trade Name	Carbon Tet	Benzene
Celoform	X	X
Cleenol V-688		X
CM 7	X	
Darex Sole Cement		X
Darex Vulca-Cement #57		X
DCF Dry Cleaning Fluid	X	X
Dermatine or Dermantine	X	
Dowilene	X	
Duflex Benzol Cement		X
DYO Flex Spot Remover	X	
EMC Dip Cleaning Solvent	X	
Energine Cleaning Fluid	X	
Epelime	X	
Erasit	X	
Excelda Dry Cleaning Fluid	X	
Film Waxing Solution PA-45	X	
Fire Extinguisher Fluid Dow	X	
Imperial Washer Clean	X	X
Industrial DCF	X	
Instant Paint and Varnish Remover		X
Kesol	X	
Kleerite	X	
Kut-Kote Paint and Varnish Remover		X
Kwik Liquid Paint and Varnish Remover		X
La France Spot Remover	X	
Lingerwett		X
Master Strip #2261		X
Miracle-Fluid	X	
Multiflex MM	X	
Multi-Kleen'r	X	
Notol #1		X
Pan Glaze		X
Phenoid Liquid Remover		X
Plastic Drawing Compound D-1523	X	
Pyrene	X	
Red Comet CM-7	X	
Resyn-Thinner #902		X
Retac R.C. Thinner		X
Sapolin Paint and Varnish Remover		X
Solvol		X
Supergrip Sole Attaching Cement		X
Tollac Solvents		X
Tomac Whisk	X	
Typene	X	
Type Wash (American Type Founders)	X	
Type Wash (Beacon Paint Company)		X
Wessco Adhesive Remover	X	X
Zellers Printers Roll Wash		X
Zip Type Cleaner	X	

J. M.

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ACCIDENT PATHOLOGY SYMPOSIUM

An accident pathology symposium was held at Naval Safety Center on September 24-25, 1968. Rear Admiral Roger W. MEHLE, Commander, Naval Safety Center, opened the symposium. The following is a list of the attendees and participants and a summary of the minutes of the meeting:

Attendees

Surgeon Commander Henry D. OLIVER, RCN (Chairman, JCAP)
Surgeon Commander John RAWLINS, RN (British Embassy, Washington, D.C.)
Captain Robert MCDONOUGH, MC, USN (BUMED)
Colonel Claude K. LEEPER, USAF, MC, (AFIP)
Captain Robert RHODES, MC, USA (AFIP)
Commander Eugene COLANGELO, MC, USN (AFIP)
Lieutenant Colonel Abel DOMINGUEZ, USAF, MSC (AFIP)
Lieutenant Colonel William BERNER, MC, USA (USABAAR)
Rowland Bedell, M.D. (FAA), AM-120
Leo R. Goldbaum, PhD (AFIP)

Naval Safety Center Participants

Captain Frank H. AUSTIN, MC, USN, Head, Life Sciences Department
Lieutenant Commander Donald DAHLMAN, Accident Investigation Staff
Lieutenant Richard A. HALVERSON, MC, USN, Head, Biomedical Division, Life Sciences Department
Mr. John T. Maccioli, Head, Environmental Health Division, Life Sciences Department
Mr. Jerry T. Eccles, Head, Records and Data Processing Department
Mr. Fred Radcliffe, Medical Information Specialist, Records and Data Processing Department

Summary and Conclusions

The purpose of the symposium was to exchange ideas on the goals of aviation pathology-toxicology in accident investigation/prevention and to obtain guidance for aviation pathology-related efforts at the Naval Safety Center.

Several participants expressed the idea that future efforts in accident pathology should serve broad common interests, applying to non-aviation areas such as surface and underwater accidents. There is a shortage in all services of accident pathologists. The future needs of the services could be

(Continued)

Accident Pathology Symposium (Continued)

met by training flight surgeons or other medical types in accident-pathology investigation and techniques. The Navy could possibly use three such individuals: one at NAVSAFECEN, one at AIRPAC, and one at AIRLANT.

One of the needs for this accident pathologist-trained medical type is to sit in on pertinent accident board deliberations and to be available to render assistance and advice to the accident investigation staff.

Accident data and specimens submitted to AFIP by the services is in many cases insufficient for proper pathological evaluation. There is an apparent need at times for direct communication with AFIP during investigation of fatal accidents.

Major break-through in pathological investigations will probably come in the areas of toxicology or biochemistry. The need was discussed for studying the biochemistry of hangover (acetaldehyde metabolite level and brain hydration) to develop an indicator and study its relation to performance decrement. Post mortem study of eyes as an indicator of spin and study of the micro-pathology of the inner ear as a possible indicator for vertigo were recommended. The possibility of using nitrogen level determination in fluids to relate to the presence/absence of hypoxia was suggested. Problems and future methods relating to detecting overdose of drugs were discussed. AFIP will look into doing research in these areas. The Navy is currently conducting human biochemical studies (phospholipids/steroids levels) to try to correlate levels with fatigue in pilots.

Types of potentially useful studies, based on pathological data in the NAVSAFECEN data bank, were discussed but firm recommendations were not made in this area. However, these discussions were useful in problem presentation and discussion.

J. M.

* * *

SPECIAL NOTES FOR FLIGHT SURGEONS AND AVT'S PREPARING THE NEW MOR

The new MOR's are pouring in and on the whole we are gratified with the results of the three years of work that went into design of the form. The check list format produces a lengthy report but the results are well worth it. With your cooperation in completing all the required sections we are gaining valuable information which has not been available in the past. We hope that you are also gaining increased insight into the nature of the problem areas which concern all of us in our efforts to reduce aviation accidents and their toll in human lives.

A new form always presents some problems, especially if you have become used to a different system. We have now received enough of the new MOR's to recognize some common "pitfalls."

SPECIAL NOTES... (Continued)

Before you prepare your next (or your first) MOR, check the comments below - they are discrepancies, errors and unsatisfactory procedural methods which we have noted in several reports.

If you have any questions concerning MOR preparation, please let us know. Our autovon number is 244-3321.

General

1. Since Naval Safety Center has taken over the job of reproducing copies for further distribution (reducing the flight surgeon's workload), it is imperative that copies submitted be:

a. Clean and clear. This means no fuzzy carbon copy and no smeared copy run off on local duplicating facilities.

b. Complete. In several instances where machine-duplicate copies have been submitted, they were not processed carefully and the bottom or top lines of some pages were cut off.

c. Line carbons up exactly so that blocks in the copies will be checked in the right place.

2. Submit all required sections. Refer to Change 2, paragraph 53, page 36- Form Preparation Instructions. Sub-paragraphs indicate submission requirements for each section. Instructions are also printed on the MOR itself for sections 8C, 8D, 8F and 8G.

3. Do not submit sections not required. There are mishaps in which 8B, 8C, 8G and 8H do not apply. If 8B does not apply, be sure that the lack of injury (Code G) is noted on page 8A. Also, please list sections not submitted on your comment sheet (8I) so that we will know that pertinent sections have not been mislaid in assembling your report.

4. Check your factual data. Be sure your report does not contradict the accident board findings in such matters as ejection altitude, aircraft identification, damage, etc.

5. If more than one person is involved, assemble MOR's by individual. Each person's report is in essence a separate MOR.

6. Be sure that two advance copies are submitted - one with each advance copy of the AAR.

SPECIAL NOTES... (Continued)

Specific

1. Form 8B. Treat each injury as a separate diagnosis. Example: Compression fractures of T-12 and L-1 are two injuries. This is necessary so that coding personnel can complete the blocks on the right.

2. Form 8B. Explain abnormal lab test results, if possible, or indicate follow-up studies.

3. Form 8C. Please be more selective in choosing psycho-physiological factors. There are so many factors reported at times that they overlap and lose their significance.

4. Form 8D. Please complete the chronological account of activities of previous 72 hrs even though your review reveals "no pertinent information." These data are needed for special studies.

5. Form 8E. Be more specific in identifying flight clothing - particularly (a) nomex vice regular summer flight suit, (b) safety or steel toe boots, (c) type helmet and its configuration.

No - No's!

1. Submit a complete report. Do not "refer to AAR." The MOR should be a complete document on the personnel involved in a mishap as it is the only part of the mishap report received by some of the addressees to whom Safety Center will send copies. Although the complete record sent to the Safety Center is processed as one document, the MOR and AAR are ultimately separated for further use by cognizant departments. After completing your MOR read it through to see if it can "stand alone."

2. Do not use aircrew statements alone in your Narrative Account of Mishap (8A). This is not considered a complete or objective account of the accident. The flight surgeon's Narrative Account should be based on the findings of the Accident Board and may in fact consist of a condensed version of the AAR account with aeromedical additions as you see fit.

3. Do not indicate that certain items are Not Applicable (NA) in required sections. Even though training, equipment, 72-hour history, etc., may not be considered as being pertinent to a specific mishap, this information is desired for background data and provides valuable information for Safety Center studies.

4. Do not refer us to another source for obtaining required information such as lab test results. You are our source of information. If supplementary reports (autopsy, lab, etc.) are not completed at the time of MOR submission, indicate that they will be forwarded when completed - AND PLEASE DO SO!

* * *

THE HUMAN THERMOSTAT

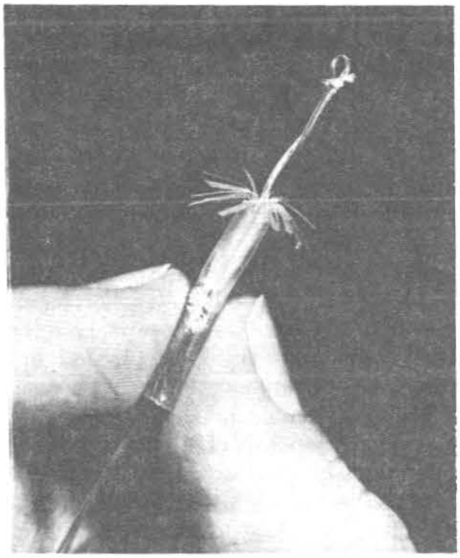
The following article, "The Human Thermostat," by T. H. Benzinger, Sc.D, M.D., is reprinted from the January 1961 issue of Scientific American with the permission of W. H. Freeman and Company, publisher. The article is copyrighted 1961 by Scientific American, Inc., all rights reserved.

It is felt that this article will be of general interest to flight surgeons. (An article on heat injury, its symptoms and treatment will appear in a forthcoming issue of Approach based on an actual case of pilot heat exhaustion in flight and material from BUMEDINST 6200.7, Heat Casualties; prevention of and TB Med 175, The Etiology, Prevention, Diagnosis and Treatment of Adverse Effects of Heat.)

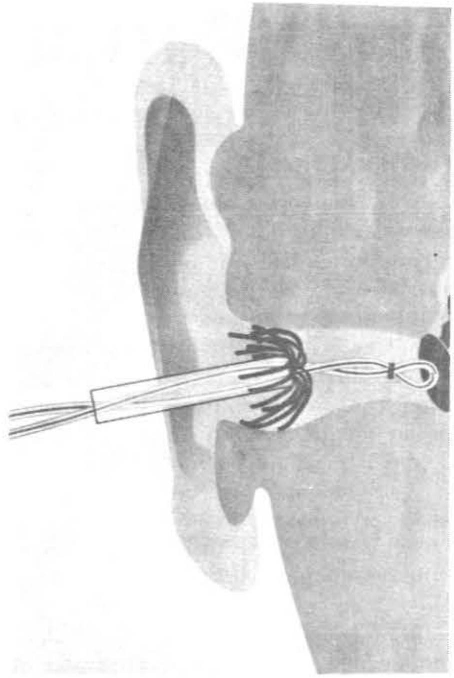
Dr. Benzinger is head of the Calorimetry Division and director of the Bioenergetics Laboratories of the Naval Medical Research Institute, Bethesda, Maryland. He is internationally known for his excellent research and discoveries in such areas as human thermoregulation, thermo-dynamics of key biochemical reactions, human gradient calorimetry and micro-calorimetric studies and ear thermometry.

Personal correspondence received recently from Dr. Benzinger, indicates that the findings expressed in his article on heat mechanisms and ear calorimetry are essentially up-to-date and correct. Other recent findings relate to the other half of the human temperature control, namely chemical thermo-regulation (cold situations) by increased metabolic activity. Dr. Benzinger adds that in 1968 the tympanic membrane measurement of body temperature became a clinical procedure with testing underway at various medical centers. He maintains that from the standpoint of scientific aspects, acceptability (cleanliness, convenience, etc.), reproducibility, lack of contraindications, and standardization, the ear thermometer is more applicable to clinical thermometry than either rectal or esophageal (taken to mean "oral") measurements.

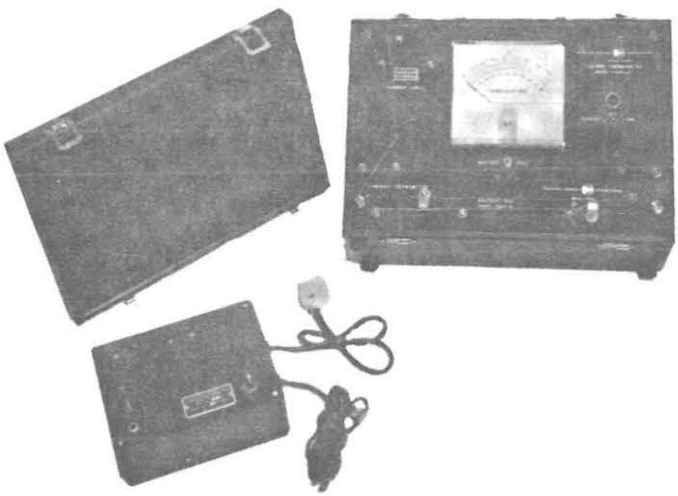
The photographs and drawing on the following page illustrate the ear thermometer, its insertion into the ear, and a preliminary data sketch of measuring equipment proposed by a manufacturer.



"Ear" Thermometer



Insertion into Ear Canal



Tympanic Thermometer -From preliminary data sheet from manufacturer

THE HUMAN THERMOSTAT

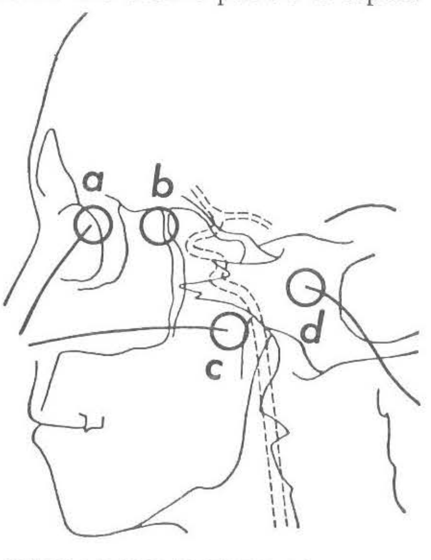
by T. H. Benzinger

Fever is usually the first symptom to arouse concern in illness. The rise in body temperature is not great in the absolute sense. On the contrary, the attention it attracts is a measure of the constancy with which the body temperature is normally maintained. Compared to the daily and seasonal variation in the temperature of "cold-blooded" animals, whose internal temperature depends upon that of the environment, a fever represents a tiny variation in temperature. Yet it is many times greater than the normal variation in the regulated temperature of the healthy body. In spite of large differences in environmental temperature—from the arctic tundra and windswept highlands to fiery deserts and steaming jungles, from season to season and from day to night—the body temperature departs little from the norm of 37 degrees centigrade (98.6 degrees Fahrenheit). Life in the cells continues undisturbed, although the metabolic processes are irrevocably linked to temperature by the laws of thermodynamics and the kinetics of chemical reactions.

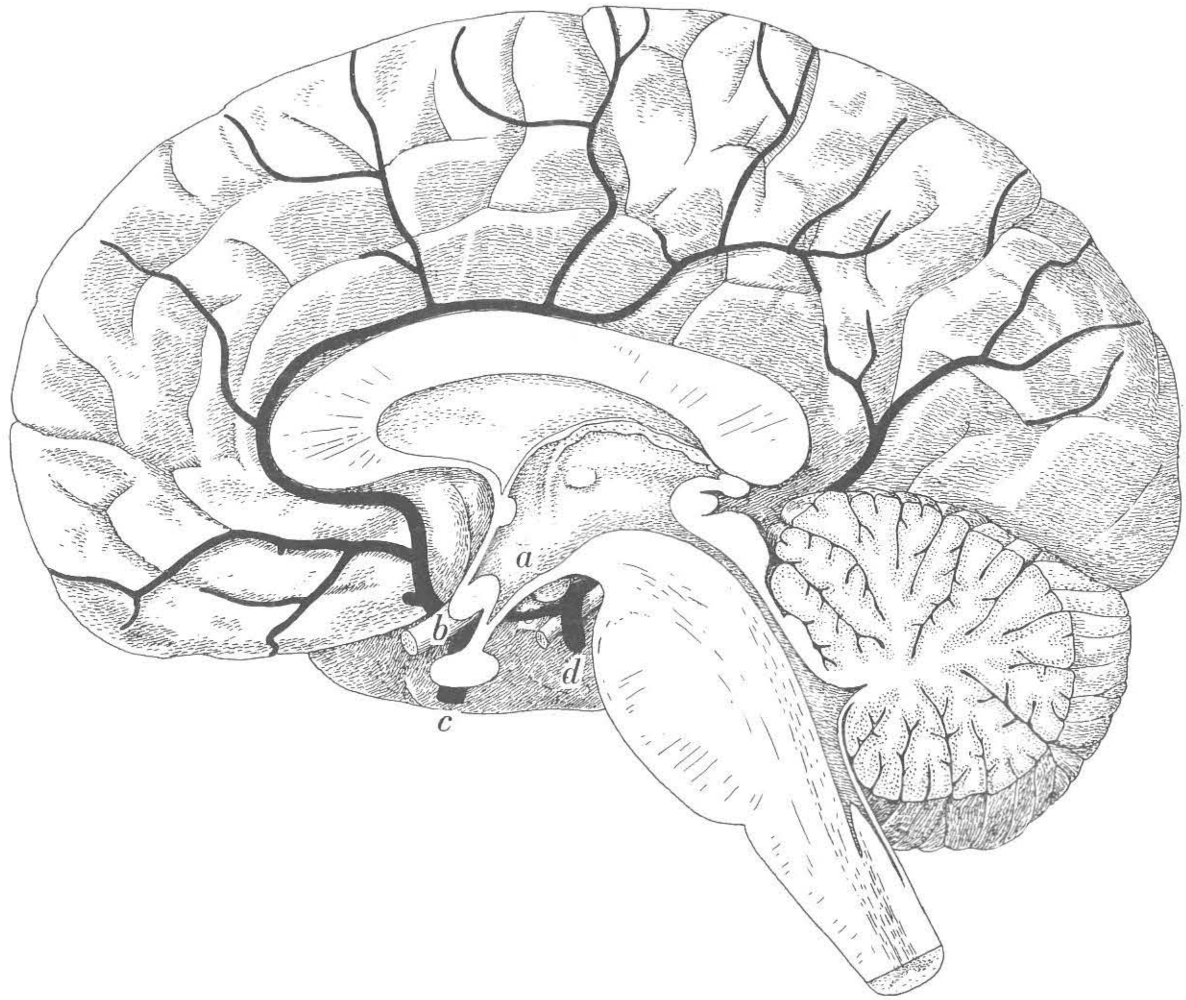
Heat is a by-product of these processes. With the body at rest, the heat of basal metabolism easily supplies the necessary interior warmth when external conditions are comfortably cool. Only under extreme conditions does the system fail; as when, in a hot environment, physical effort fans the flame of the metabolic furnace beyond control by the regulatory system; or when, in a very cold environment, the loss of heat by radiation, conduction and convection overbalances the metabolic production of heat and reduces body temperature to a fatal degree. Man of course shares this vital capacity with other mammals and with birds. Favored in consequence with nervous systems maintained at optimal working temperatures under all environmental conditions, the "warm-blooded" animals have become masters of the living world on our planet.

The question of how the body keeps its temperature constant within such narrow limits has engaged the efforts of an astonishing number of investigators. It is only recently, however, that one of the two parts of the regulating mechanism—defense against overheating—has been clarified. Max Rubner of Berlin had recognized in 1900 that sweating and the dilation of the peripheral blood vessels constitute the effector mechanisms for the dissipation of excess heat from the body. E. Aronsohn and J. Sachs, two medical students at the University of Berlin, came upon the center of control in the brain as long ago as 1884, when they damaged in animals an area "adjacent to the corpus striatum toward the midline." A few months earlier Charles Richet of Paris had also produced excessive body temperature by puncturing the forebrain. It now seems certain that in both cases the investigators damaged the hypothalamus, an area at the base of the brain stem just above the crossing of the optic nerves.

But how does the body sense and measure its temperature and bring the control center into action? The investigation of this question was confused for a long time by the conspicuous part that the temperature-sensitive nerve endings in the skin play in the feeling of warmth and cold. In recent years, however, a new approach to the problem has been made possible by the development of a new principle of measurement called gradient calorimetry and of the instrumentation to go with it. Experiments employing this instrumentation have now located the sensory end-organ at which the body "takes" its own temperature when it becomes too warm. The discovery is an unusual one at this late date in the history of physiology. The body's "thermostat" must now be included in the short list of major sensory organs adapted to the primary reception and measurement of physical or chemical quantities. Moreover, it now becomes possible to measure the characteristic responses of the thermostat and perhaps to produce or to suppress those responses artificially. Such investigation will lead to a better understanding not only of the aberration of fever but also of the precise regulation of internal temperature that is so important to the vital function of the body, particularly to the function of the delicate nervous system. With the thermostat identified, it has also become possible to explain



TEMPERATURE AT THERMOSTAT in the brain is measured by thermocouples placed at forward wall of ethmoid sinus (a), deep in rear wall of nasopharyngeal cavity (c) and at eardrum (d). Thermostat itself is in hypothalamus behind sphenoid sinus (b), at which temperature has also been measured by thermocouple.



HEAT CONTROL CENTER is located in forward part of hypothalamus (*a*), shown in cross section (*left*) and from below (*right*). Hypothalamus, centrally located under great hemispheres of brain, rests on the Circle of Willis (*e*), an arterial ring through which

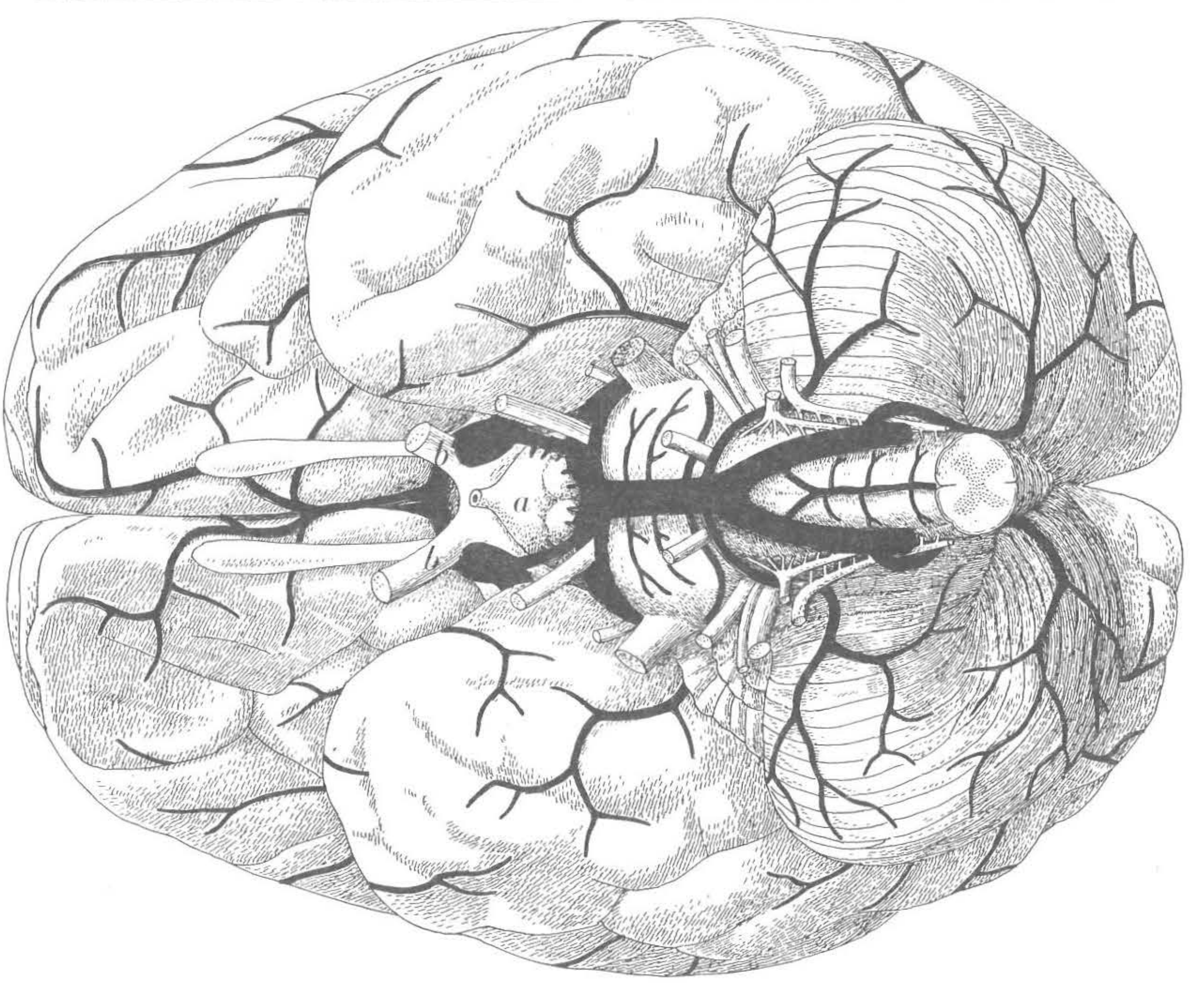
the effects of such mundane factors as a hot meal, a cold drink, a hot bath and a cold shower.

When one encounters a physical or chemical quantity in technology or in a living organism that is maintained at a constant level against disturbances from outside, one looks for a "servomechanism." Pressure, rate of flow, chemical composition or temperature are automatically controlled by such mechanisms in the realm of engineering. The servomechanisms of the body control the same kinds of variable. In man-made devices the chain of control begins with a "sensory" instrument, perhaps a thermometer, which measures the variable in question. The measurement is relayed to a "controller" which compares it with a set point to which the variable is to be held. Whenever the need arises, the controller sends instruction to an "effector" mechanism, perhaps to the heating system, which brings the temperature into accord with the set point in the controller [see "Feedback," by Arnold Tustin; SCIENTIFIC AMERICAN, September, 1952].

The corresponding elements in biological servomechanisms and the nervous and chemical pathways that interconnect the sites of stimulus and response constitute systems of far greater complexity. They are nonetheless put together in a similar way. A servomechanism in the human body may be considered to be clarified when the sensory organ, the controller and the effector mechanism are known, and when a reproducible, inseparable and quantitative relation has been established between the magnitudes of the stimuli and of the responses they induce. The net effect of the response must be the restoration of "homeostatic" equilibrium; that is, the variable in question must return to the optimum, stable level essential to the life of the cells.

In the control circuit that prevents overheating of the body, classical physiology had identified the effector and the controller mechanism, but not the sensory organ. In a hot environment, as Rubner showed, the effector is the dilation of the blood vessels in the skin, which increases the transport of heat from the interior of the body to the surface; and sweating, which increases the rate of total heat loss from the surface to the environment as energy is absorbed in evaporation. In a cold environment the corresponding mechanism is increased metabolic heat-production.

The location of the controller in the hypothalamus by Aronsohn and Sachs



blood supply to the brain flows from carotid arteries (*c and c'*) and basilar artery (*d*). Hypothalamus, optic nerves (*b and b'*) and retina derive from same tissue matrix. Bulb of pituitary gland attached to hypothalamus appears at left, but is cut away at right.

was confirmed by later investigators. Some of them applied the stimulus of temperature directly to the site. In 1904 Richard Hans Kahn of the German University in Prague found that heating the head arteries of a dog lowered its body temperature. In 1912 Henry Gray Barbour, a young American physician working in Vienna, carrying out an experiment designed by the pharmacologist H. Meyer, applied warm and cold probes to the general area of the hypothalamus. He observed the expected thermoregulatory responses. In 1938 Horace W. Magoun, now at the University of California at Los Angeles, discovered that this function is mediated by a circumscribed area in the forward part of the hypothalamus. Bengt Andersson of the Royal Swedish Veterinary Institute in 1956 delineated the organ with unprecedented precision in goats. In 1950 Curt von Euler of the Nobel Neurophysiological Institute in Stockholm even succeeded in recording, in parallel with temperature changes, slow electrical "action potentials" from this area of the hypothalamus of cats.

But the body is also equipped with an elaborate system of millions of tiny sensitive nerve endings, distributed throughout the skin, which produce conscious sensations of warmth. The scientific literature tended to support the view that the skin and not the hypothalamus furnishes the primary temperature measurements to the control center for sweating and the dilation of the arteries. Some investigators held that both systems were involved; a rise in the temperature of the "heat center" in the hypothalamus supposedly made it more responsive to incoming impulses from the temperature-sensing organs of the skin. The question, in this view, was one of determining the relative importance of the two sites. It was also possible, as some believed, that the body possessed a third area sensitive to temperature or heat flow, and that neither the skin nor the brain was involved.

It was not easy to design a conclusive experiment. In experimental animals one might destroy the nervous pathways from the thermoreceptors in the skin to the heat center. But the results of such an experiment would not exclude the possibility that the temperature of these centers played a role in heat regulation under normal conditions. It would still be necessary to carry out the reverse experiment and destroy the heat-sensitive part of the hypothalamus. Since this structure is intimately involved with the temperature-control center itself, it

seems impossible to secure the final evidence by surgical procedures alone.

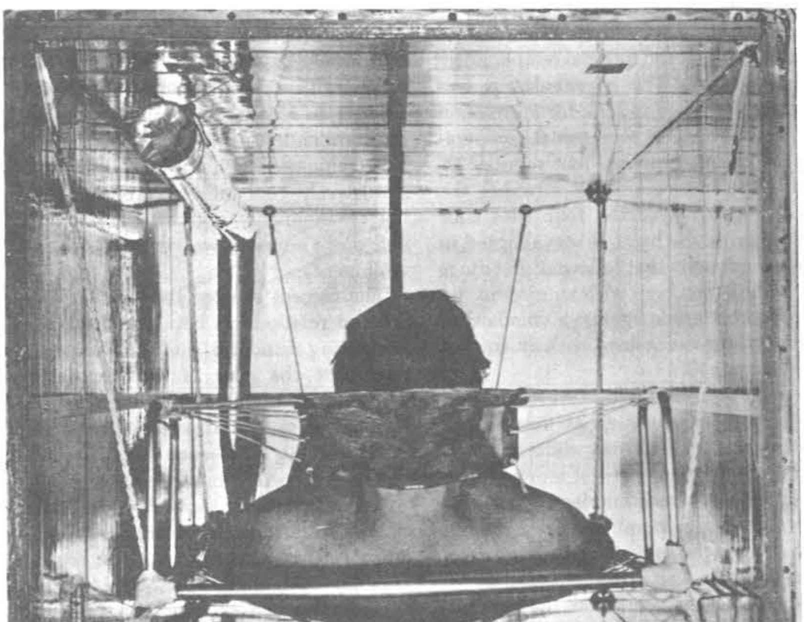
To observe the operation of sensory receptors in the skin and in the brain independently of each other in the intact organism presented comparable difficulties. No one, apparently, had succeeded in keeping one of the two sites at a constant temperature while observing the effects brought about by a temperature change in the other. This approach called for techniques to measure temperature in the human body at the two sites of presumed temperature-reception—the skin and the hypothalamus—and some way to record, rapidly and continuously, the effector responses of vasodilation and sweating.

The gradient calorimeter has satisfied the second of these two requirements. This rapidly responding and continuously recording successor to the classical calorimeter makes it possible to record for the first time the total output of the effector mechanisms. It measures separately the heat that is carried from the body by radiation and convection and the heat that is dissipated by the evaporation of sweat. From working models made and tested by Charlotte Kitzinger at the Naval Medical Research Institute in Bethesda, Md., the first full-scale human gradient calorimeter was constructed under the direction of Richard G. Huebscher at the laboratory of the American Society of Heating and Ventilating Engineers in Cleveland. Similar units have now been constructed at other laboratories. The gradient calorimeter now operated at Bethesda is a chamber large enough to hold a man stretched out at full length [*see illustration below*]. The subject is suspended in an open-weave sling, out of contact with the floor or walls of the chamber, and is free to go through the motions of prescribed exercise when the experiment calls for such exertion.

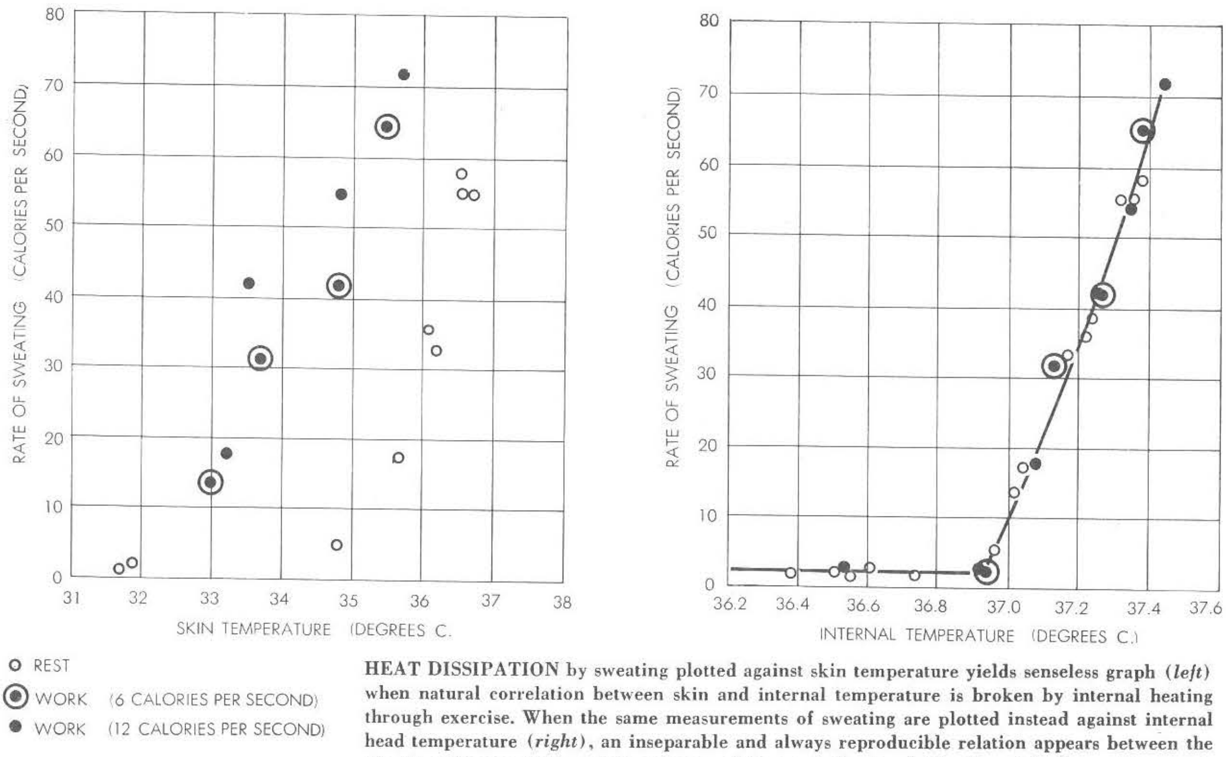
The new and essential feature of gradient calorimetry is the "gradient layer," a thin foil of material with a uniform resistance to heat flow which lines the entire inner surface of the chamber. Some thousands of thermoelectric junctions interlace the foil in a regular pattern and measure the local difference in temperature (and hence the local heat flow) at as many points across the foil. The junctions are wired in series; their readings are thus recorded in a single potential at the terminals of the circuit. That potential measures the total energetic output from the subject's skin, independent of his position with respect to the surfaces of the gradient layer lining the chamber. The rate of blood flow through the skin can be derived by computing this measurement against the temperature of the outgoing blood (measured internally) and the temperature of the returning blood (measured on the skin), since the observed transfer of heat per unit time at any given difference between internal and external temperature can be effected by only one calculable rate of blood flow. The energy dissipated by evaporation from the subject's skin is also measured by gradient layers which line heat-exchange meters at the inlet and outlet of the air circuit of the calorimeter. Measurements taken for control make it possible to maintain the same temperature and humidity in the air at these two points, so that the air neither gains nor loses energy as it passes through the system. The unbalanced output from the additional gradient layers thus precisely measures the heat loss by evaporation and hence the sweat-gland activity. Heat loss through the lungs is measured separately and subtracted from the total.

With the help of the gradient calorimeter our group at Bethesda set out to establish the correlations obtaining, on the one hand, between the performance of the effector mechanisms and the temperature of the skin and, on the other hand, between the performance of the effector mechanisms and the internal temperature of the body. In these first experiments it was assumed that rectal temperature provided an adequate index of internal temperature as measured at the internal temperature-sensing organ, wherever that might be located. But no correlation could be found, in either resting or "working" subjects, between rectal temperature and the observed rates of sweating. Measurement of skin temperature against the same heat-dissipation variable yielded equally meaningless plots. For a time it seemed that all the effort that had gone into the design of the gradient calorimeter had been wasted. The results made sense only in terms of the classical notion that the thermostat in the interior of the body and the temperature-sensing nerve endings in the skin have indissolubly interlaced effects upon the vasodilation and sweating responses.

Then we found a way to measure the internal temperature of the body at a site near the center of temperature regulation in the brain. We introduced a thermocouple through the outer ear canal and held it against the eardrum membrane under slight pressure. The eardrum is near the hypothalamus and shares a common blood supply with it from the internal carotid artery. At the



HUMAN GRADIENT CALORIMETER makes it possible to correlate body temperature with dissipation of heat by radiation and convection from skin and by evaporation of sweat. Lining of chamber is interlaced with thermoelectric junctions which measure heat loss from skin; loss by sweating is measured by temperature and humidity control system of calorimeter.



HEAT DISSIPATION by sweating plotted against skin temperature yields senseless graph (*left*) when natural correlation between skin and internal temperature is broken by internal heating through exercise. When the same measurements of sweating are plotted instead against internal head temperature (*right*), an inseparable and always reproducible relation appears between the stimulus of temperature and the response of the sweat glands, whether the subject is sweating or not.

very first attempt we observed temperature changes associated with the eating of ice or the drinking of hot fluids, and we soon found we could detect variations caused by immersion of the limbs in warm water. Parallel rectal measurement did not show these variations at all. To make sure that the entire region of the head supplied by the carotid arteries can be expected to show the same temperature variations as the eardrum, we tried other sites. With the help of local anesthesia H. W. Taylor, a surgeon at the Naval Hospital in Bethesda, placed thermocouples in our heads: at the main trunk of the internal carotid in the rear of the nasopharyngeal cavity, in the nasal cavity below the forebrain and at the forward wall of the sphenoid sinus only one inch away from the hypothalamus [*see illustration on pages 2 and 3*]. Continuous measurements of temperature at these points showed large discrepancies with internal temperature as measured at the rectum.

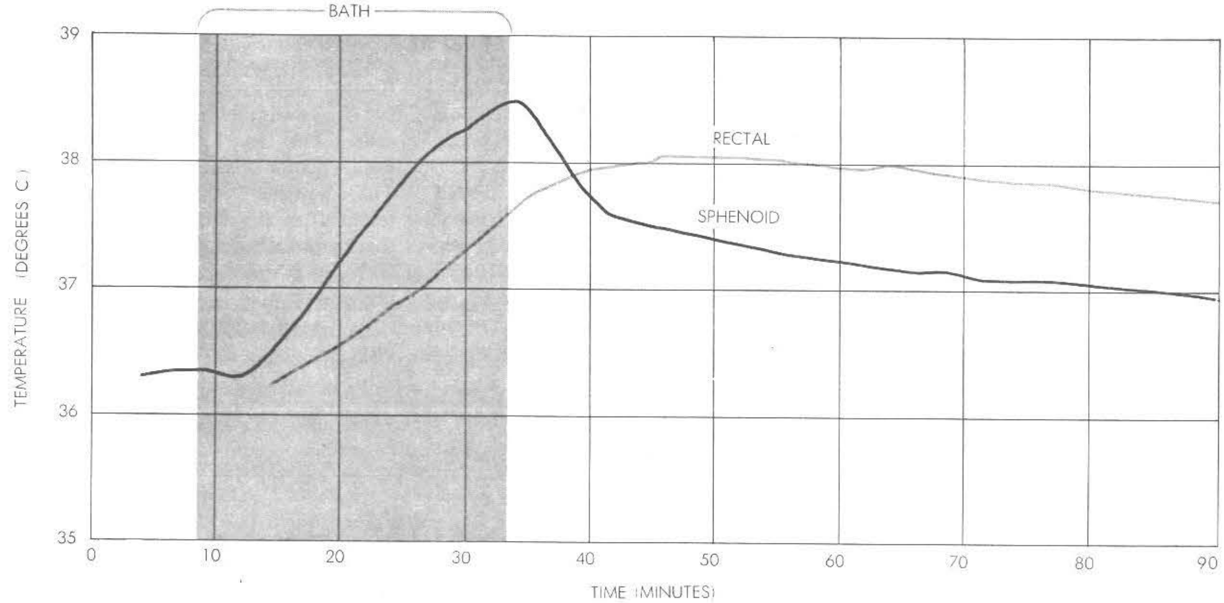
The discrepancies appeared before and after the subject exerted himself by physical exercise, after internal cooling by the eating of ice, after warming the arms or legs in warm water and cooling them in cold water and after immersing the whole body in warm or cold water. These were precisely the situations in which earlier experimenters had found the same absence of correlation between rectal temperature and the heat-dissipating responses of vasodilation and sweating. It was clear that the temperature at the rectum could under no circumstances be trusted as reflecting the temperature at the internal temperature-sensing organ. The hypothalamus was plainly the place to look for correlation between changes of internal temperature and the responses that regulate it. Since the eardrum is by all odds the most accessible of the four sites thus measured in the head, it was adopted in the experiments that followed. Readings could be taken here with an error of .01 degree centigrade against a standard of temperature maintained with an error of .002 degree C.

The subjects now spent time in the calorimeter on many different days at different environmental temperatures ranging from almost intolerably cold for the nude body at rest to almost intolerably hot for the subject undergoing exertion. Between these two extremes, measurements were made for all the intermediate levels at five-degree temperature intervals and with the subject at rest and at work. Under each set of circumstances the instruments kept a continuous record as the state of homeostasis was reached and maintained for one hour. This arduous series of experiments, extended over two months, made it possible to plot for the first time the heat-dissipating responses of vasodilation and sweating independently against skin temperature and against internal head temperature. The volunteer subject for this series, Lawrence R. Neff, was observed with a cool skin and cool interior (resting in a cold environment), with a cool skin and warm interior (working in a cold environment), with a hot skin and a relatively cool interior (resting in a hot environment) and with a hot skin and warm interior (working in a hot environment).

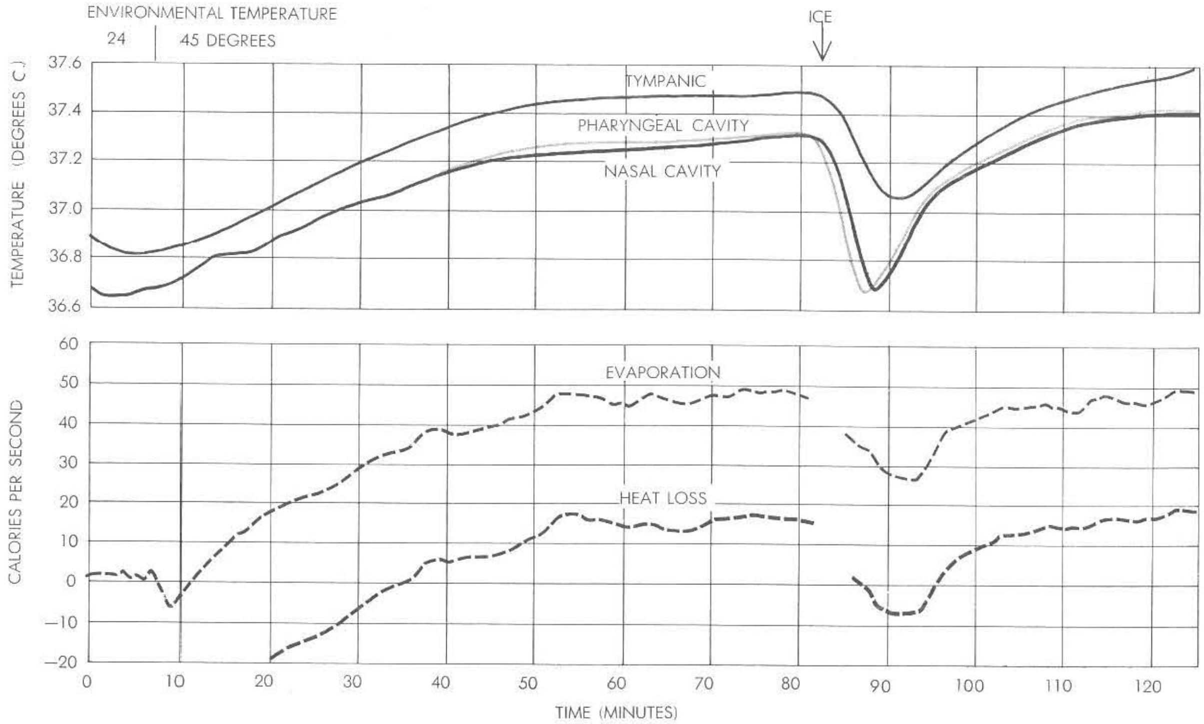
The records showed the familiar disordered relationship between the heat-dissipating responses and skin temperature. But the plot of the responses against eardrum temperature showed an almost perfect undisturbed relation. Whatever the temperature of the skin, one certain specific rate of sweating and no other invariably showed up in association with a given internal temperature measured at the eardrum. A reproducible, inseparable and quantitative relation between the stimulus of temperature and one of the heat-dissipating responses had at last been observed. It exhibited a sharply defined breakoff at 36.9 degrees C. (98.4 degrees F.). This was no doubt the set point of the human thermostat in this subject at the time of the experiment. The response proved to be so forceful that a mere .01-degree-C.

rise in temperature was sufficient to increase the dissipation of heat through sweating by one calorie per second and to raise the blood flow through the skin by 15 milliliters per minute.

The success of this series of experiments in distinguishing between the variations in skin and brain temperature was confirmed in many other experiments that subjected the body to quite different sets of extremes. In one of them the skin and the interior of the body were warmed as the subject accommodated himself in the calorimeter to an environmental temperature of 45 degrees C. (113 degrees F.). With homeostasis attained, the subject gulped down large measured helpings of sherbet three times at suitable intervals. On each occasion, as the melting ice withdrew heat from the internal organs and the circulating blood, the brain temperature declined. No less impressively, the skin temperature was observed to rise. The curve



RECTAL TEMPERATURE is shown in this graph to have an uncertain relationship to the hypothalamic temperature measured at the forward wall of the sphenoid sinus. The sphenoid temperature rises sharply as an experimental subject enters a warm bath and falls off sharply when the subject leaves the bath. The rectal temperature reaches a peak only after the subject has left the bath.



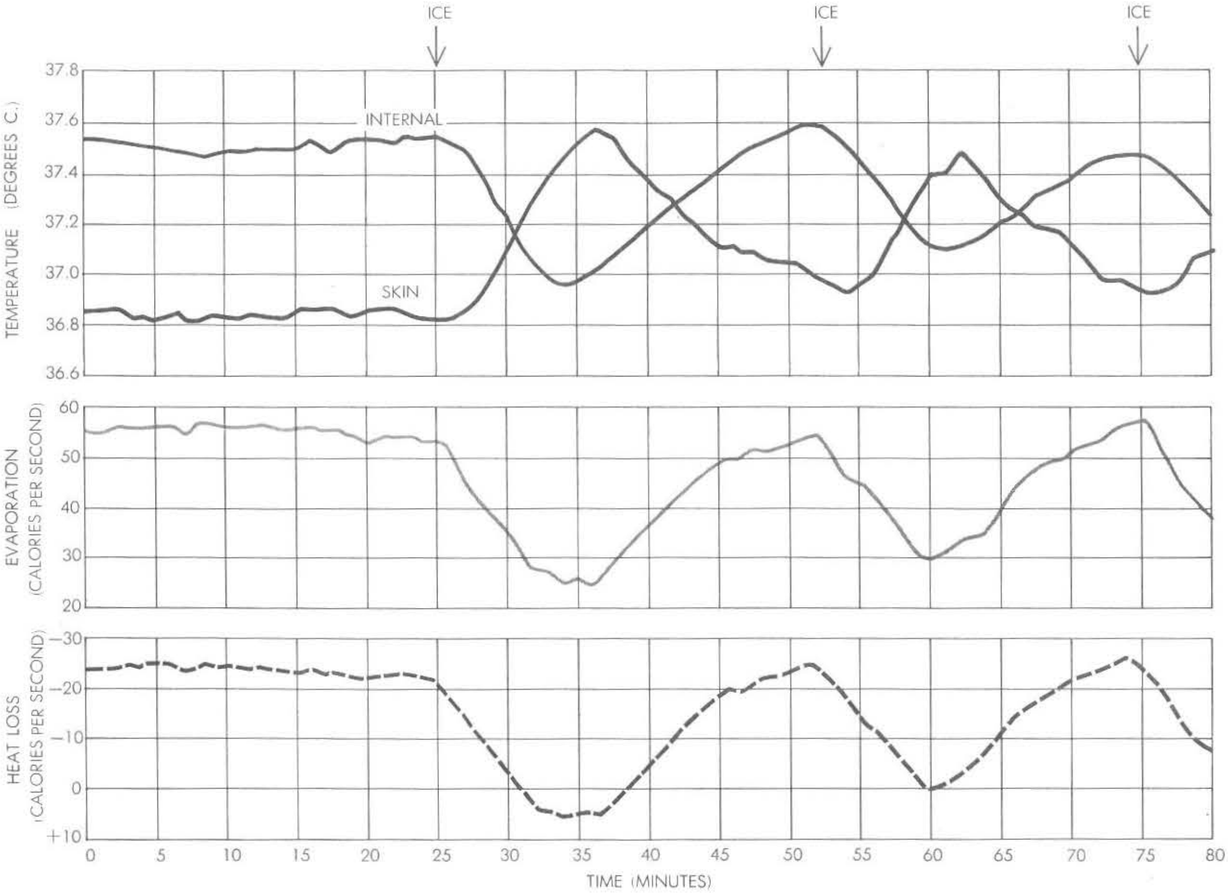
MEASUREMENTS OF HEAD TEMPERATURE at three points near the hypothal..mus—at eardrum (*tympanic*), at ethmoid sinus (*nasal cavity*) and in rear wall of pharyngeal cavity—show close correspondence with one another and with the heat dissipation by evaporation of sweat and heat loss by vasodilation. Location of these points is shown in the illustration on .pages 2 and 3.

drawn by sweat-gland activity now showed unequivocally which temperature-sensing system controls the heat-dissipating responses: the rate of sweating fell off and rose in perfect parallel with the decline and rise in internal head temperature. It was the consequent drying of the skin that caused the skin to be heated by radiation and conduction in the hot environment. But the sensory reception of heat in the skin brought no response from the heat-dissipating mechanism.

These observations accord well with the familiar constancy of the body temperature. It is difficult to see how it could be maintained within the same narrow range, year in and year out, if the heat-controlling responses were not always triggered at the same set point. As these experiments show, moreover, the responses always closely match the magnitude of the stimulus. Such precise regulation of temperature could not be achieved by measurement of skin temperature. As in all feedback systems, the quantity which is controlled must itself be measured. An architect who wants to control the temperature of a house does not distribute thousands of thermometers over the outside walls. One thermostat in the living room suffices. It responds not only to warming and chilling from out-of-doors but to overheating from within. The thermostat in the hypothalamus similarly monitors the internal temperature of the body from the inside and thereby maintains its constancy.

This is not to say that the warm-sensitive nerve endings of the skin have no function in the regulation of body temperature. They are the sensory organs for another system which operates via the centers of consciousness in the cortex, bypassing the unconscious control center in the hypothalamus. To sensations of heat or cold reported by the skin the body reacts by using the muscles as effector organs. Under the stimulus of discomfort from the extremes of both heat and cold, man seeks a cooler or a warmer environment or takes the measures necessary to make his environment comfortably cool or warm. But for all the mastery of external circumstances that follows from this linkage in the body's temperature-sensing equipment, the skin thermoreceptors cannot regulate internal temperature with any degree of precision. They can contribute directly to the regulation of skin temperature alone. The automatic system of hypothalamic temperature regulation takes over from there and achieves the final adjustment with almost unbelievable sensitivity and precision.

In the regulation of internal temperature, therefore, the hypothalamus can



CONCLUSIVE EXPERIMENT establishing hypothalamic temperature as key to control of body temperature is charted. At left in top chart the subject's hypothalamic (internal) temperature is stabilized at the "normal" 37 degrees C. in an environment of 45 degrees C. (113 degrees F.). Upon ingestion of ice at half-hour intervals, internal temperature drops sharply and skin temperature ascends. In middle chart rate of sweating falls and rises in close correlation with hypothalamic temperature; shutdown of sweating accounts for rise in skin temperature. In bottom chart heat loss from skin shows same correlation with hypothalamic temperature.

no longer be regarded simply as a controller which converts incoming sensory stimuli into outgoing impulses to the effector system. It is itself the site of a receptor end-organ, an "eye" for temperature comparable to the retina—the receptor organ for light. This analogy between the temperature eye and the optical eye has, in fact, a sound anatomical basis. Both are derived from the same matrix: the bottom of the third ventricle of the brain. These are two parts of the brain that have a proved sensory receptor function. In the course of evolution the optical eye moved outward to connect with a dioptric apparatus partly derived from the skin, and thereby gained a view of the external world. The temperature eye in the hypothalamus is located in the interior of the head, where it properly belongs. It measures as well as regulates the temperature of the blood which bathes its cells and the rest of the brain, the vital function of which requires a closely maintained optimal temperature.

The feedback system that dissipates heat and thus keeps the body from overheating under normal conditions has thus been elucidated. The same cannot be said, however, of the regulatory system that steps up metabolic heat production and keeps the body temperature from falling below the optimum level. It appears that the two systems operate quite differently and that in the metabolic warming-up of the body the temperature-eye performs its task by inhibition of sensory impulses originating elsewhere.

On the other hand, the sure location of the thermostat in experiments on the "warm side" now makes it possible to renew the study of many interesting questions. Temperature measurements at sites that reliably reflect hypothalamic temperature should replace rectal observations of temperature in all these studies and even in some clinical situations. How bacterial toxins produce fever and how drugs act to reduce it can now be redefined in terms of shifts in the set point of the thermostat and may be made the subject of quantitative investigation. The same direct attack may also be made upon individual or group tolerances and the adaptability of human temperature regulation. These are important objectives in connection with hypothermia (the reduction of the body temperature to low levels) in surgical operations, and with the conquest of new spaces for the life of the human species.

Aerospace Physiologist's Section

FSNL - 2nd Quarter 1969

HYPOXIA INCIDENT

The following is a report of a hypoxia incident which occurred in a U.S. Air Force C-130.

> Rose at 0600, coffee at terminal, loaded aircraft, 0900 takeoff, depressurized at 1+30 for 30 min, all systems OK, repressurized and climbed to FL 220, reported 0_2 check OK (but did not check blinker), aircraft depressurized and doors opened. Turned off door warning switches and bent down to unfasten load, noticed headache and inability to unfasten load, stood up and symptoms increased, stumbled and knelt down. Other loadmaster notified pilot of emergency, placed regulator in emergency position, changed 0_2 hose to different regulator when no immediate response. Patient denied feeling air flow when regulator on emergency but improved rapidly. Noted heavy fogging of helmet visor when recovering but states he was unable to do anything after feeling dizzy upon standing the first time. Asymptomatic except for headache within 2-3 minutes. Precautionary landing at 1230, patient picked up at flight line by FSO ambulance.

Here are the Air Force flight surgeon's comments and recommendations:

This case represents a simple case of hypoxia. Causation is most likely due to multiple contributing factors as follows:

1. Failure to adequately check equipment prior to use. The airman performed a PD McCripe check on the ground prior to flight and again prior to first decompression. The helmet and mask were removed after repressurization and redonned before the second maneuver. At that time the regulator was not checked for operation (blinking of indicator) but only by effect on respiration which he described as normal.

2. Main supply hose was kinked at quick disconnect. This was noted by another crewmember who changed the mask hose to another regulator when no immediate response was obtained from the emergency setting of the regulator.

(Continued)

Hypoxia Incident (Continued)

3. Mask was improperly tightened. Although the airman did not believe the mask to be too loose (he did not experience any difficulty breathing through the kinked hose), it was noted that the interior of the helmet visor was heavily fogged.

4. Delayed recognition of hypoxic symptoms. The airman noted that he was "dizzy," and developing a headache and coordination problems; when he bent to untie the load, the symptoms increased as he stood up and he stumbled backwards.

Recommendations:

1. The necessity of strict oxygen discipline including recompletion of PD McCripe prior to use of oxygen equipment be emphasized to all personnel.

2. The proper use of personal equipment, especially oxygen equipment, be periodically reemphasized.

Safety Center Comments: This particular incident is an example of an age old problem, complacency! "The equipment has been around a long time and has always worked on previous occasion" is a poor attitude and a dangerous one. Equipment preflight is important and cannot be repeated too often. Frequent reminders of same are also important!

One other point to mention is the insidious effects of hypoxia again demonstrated by the experience of this aircrewman. It does happen in airplanes as well as low pressure chambers!

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HYPOXIA OR HYPERVENTILATION?

On the third engagement of a two-plane tactical flight involving simulated combat maneuvering the flight leader felt he detected a decrement in the performance of his wingman. The leader called for a return to altitude for further maneuvering, but received no answer. He also noted the wingman to be flying rather "aimlessly." After repeated calls, the wingman responded stating he felt that he might be getting hypoxic.

(Continued)

Hypoxia or Hyperventilation? (Continued)

The wingman was instructed to take the lead and return to base at low altitude. He started off in the wrong direction but then turned to the correct heading. The previous flight leader, now the wingman, found it necessary to make all radio calls on returning to base. The flight landed without incident.

The original wingman recalls difficulty exhaling through his mask during the early phases of the flight as his breathing became more rapid and deeper during high "g" maneuvers. On the second engagement, he was unable to exhale except around his mask. He remembers entering a loop maneuver, but doesn't recall the top; he next remembers descending inverted, the nose of the aircraft falling through the horizon. He remembers being disoriented and not knowing how the aircraft had assumed this attitude nor what he was expected to do next. He was nauseated and dizzy, and had a headache. He does remember breathing rapidly and feeling short of breath. There is no recollection of numbness of hands or lips or of muscular spasm. The maneuver in question began at about FL 200 and terminated at at 10,000 ft - 13,000 ft. At no time did he experience any difficulty in inhaling through the mask, or an apparent interruption in oxygen flow. When breathing was intentionally slowed, the mask appeared to operate normally.

The flight surgeon investigating this F-8 incident stated:

"1. This incident would seem to be one of hyperventilation syndrome encountered during a simulated combat training flight.

"2. Although the pilot is unable to recall numbness or tingling in his face or extremities and further denies symptoms of neuromuscular irritability he did experience apprehension, dizziness, weakness and nausea. The following facts and circumstances would also argue for hyperventilation and against hypoxia as a cause of the mishap:

"(a) the pilot's recollection of increased respiratory rate and depth preceding the onset of other symptoms, both as a result of mission stress and difficulties with his mask;

"(b) our ability to reproduce the pilot's subjective symptoms under experimental conditions by induced hyperventilation;

"(c) free flow of oxygen in the mask, as established by the pilot's statement that he encountered no difficulty in inhaling and by a normal bench test of the mask;

"(d) the pilot's report of normal mask function when breathing was intentionally slowed."

(Continued)

Hypoxia or Hyperventilation? (Continued)

"In bench testing the involved mask," the flight surgeon continues, "no malfunction of any kind was detected by an experienced parachute rigger asked to evaluate the mask. On initial examination, the flight surgeon was also unable to see a discrepancy. However, after some experimentation, it was discovered that by combining rapid respiratory cycling with sharp exhalations, it is possible to interfere with the exhalation function of the mask. When the mask malfunctions, it is often impossible to exhale through the mask for several cycles, even when respiration is returned to normal rate and depth... The following might be the most likely explanation based solely upon familiarity with mask design: rapid cycling of the inhalation valve results in poor seating, perhaps due to physical displacement or formation of a fold in the valve material. Poor seating of the inhalation valve allows venting of the mask pressure to both sides of the exhalation valve during the exhalation cycle, preventing opening of the exhalation valve."

As a result of the squadron's UR on the mask, the Naval Air Development Center asked that the mask, hose and regulator combination be sent to the Aerospace Crew Equipment Department (ACED) for investigation. Here is ACED's report:

"Oxygen mask/components examination revealed pin hole in inhalation flapper valve and laminar seal particles throughout mask. Pin hole in flapper valve considered most probable cause of problems reported in (your message). Inhalation flapper valve also shows imperfections in material (thin spots) possibly due manufacturing defect. Weak spots although not direct cause of problem reported offer potential sites for development of pin holes. Other possible causes include moisture/dust/particles of laminar seal, any of which could result improper seating inhalation flapper valve and cause exhalation problems particularly during rapid breathing. Action concerning inhalation valve defects pending additional analysis request. During interim recommend: (a) frequent cleaning per ... CSEB 16 and (b) review of ACSB 140 and ACSE 196 concerning laminar seal."

"In questioning pilots of this command," the squadron C.O. wrote in his comments, "it is apparent that they are not fully aware of the ease with which hyperventilation can occur with pressure breathing equipment. Local reindoctrination by the flight surgeon will be accomplished immediately to reduce the possibility of recurrence of this type of incident. It is recommended that the conditions of hyperventilation be demonstrated during the low altitude phase of high altitude/pressure chamber physiological training to insure that all flight personnel in high performance aircraft are aware of its causes and effects."

(Continued)

Hypoxia or Hyperventilation? (Continued)

Safety Center Comments: Although hyperventilation incidents are not reported as frequently as hypoxia here is a good example of how serious such an occurrence can be. This is a good example for instructor use.

An additional note from the flight surgeon indicated that he learned of this incident by chance as it was not reported by the pilot. It is appropriate during physiology training to mention the importance of reporting to the flight surgeon all unusual symptoms occurring during flight.

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HYPOXIA?

A pilot reported to the squadron at 0545 to assume the operation duty till 1200. Upon completion of duty he was scheduled to fly a CAS mission which landed at 1430. He was then off duty till scheduled CAS mission briefing at 2130. Brief, taxi and takeoff were normal. An instrument departure was made to VFR conditions on top. After he leveled at 18,500' MSL approximately 10 minutes after takeoff he noticed loss of oxygen supply. He read cabin pressurization as approximately 9,500' and removed mask to ease his breathing. At this point he advised the controller that he was aborting his mission and returning to base due to loss of oxygen.

The pilot initiated a left turn to base; the controller directed an immediate right turn to avoid a restricted area hot to 32,000' MSL. The pilot remembers making a hard right turn. He does not remember making any transmissions after turning or receiving instructions from the remaining controllers. He does remember pulling emergency oxygen and having handle in his hand which he placed on glare shield. During this period of flight all he remembers is seeing bright lights and hearing noise in his head set. The wingman was approximately one mile in trail after individual instrument departure and was attempting to join when the pilot reported having lost his oxygen. The controller gave vectors to the pilot which he acknowledged after many repetitions by the controller. The wingman stated later that the pilot's transmissions were not normal and he seemed confused.

The pilot descended to 13,500' MSL VFR en route to base. At this time he was switched to approach control. Again the controller had to repeat instructions prior to the pilot switching. The pilot was cleared for straight in GCA and acknowledged the clearance but repeatedly requested heading to the field though the controller continually repeated the heading. The pilot stated he wanted to start down and requested if the

(Continued)

Hypoxia? (Continued)

field was VFR. He was cleared to 2,500', given the weather and advised there were layers of clouds but the field was VFR. He acknowledged the transmission and began his descent. The wingman lost sight of the aircraft as it entered a cloud layer. The pilot called that he was having extreme difficulty in the cloud, was squawking emergency and preparing to eject. The wingman called for him to go to RAM air which he acknowledged.

The pilot next stated he was VFR at 1,500' MSL and requested GCA instructions. GCA controlled the aircraft but the pilot only remembers hearing a gear call and on glide slope. He remembers seeing lights near touchdown and feeling the aircraft touch down. The aircraft bounced slightly and he dropped the hook for an arrested landing. The aircraft was arrested and he was taken to sick bay for examination. Lox system, pilot's regulator, mask and emergency oxygen system were tested and no malfunctions/failures existed.

ASO Recommendations: Operations must insure that pilots are not over-scheduled, the ASO states. Additional duties must be scheduled to allow adequate rest prior to flight. Pilots are to be reminded that often only they can report on their physical fitness for flight. If a doubt exists in a pilot's ability to perform his mission, he should ground himself and contact his flight surgeon for proper medication. Cause of mishap remains "unknown."

Safety Center Comments: When questions of "fitness to fly" arise, check General NATOPS Chapter 820 (Change 3). A copy of this recently issued instruction is printed on pages 8-11 in this Newsletter.

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EJECTION SUCCESS RATES

In calendar year (CY) 1968 there were 28 fatal ejections in various naval jet aircraft. There were 202 total ejections with a success rate of 86%. For those aerospace physiology training units interested in ejection narrative information for instructional purposes, information can be obtained by writing LT W.F. Cunningham, MSC, Life Sciences Department, Naval Safety Center, Naval Air Station, Norfolk, Va. 23511 or calling Autovon 244-3321.

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- LT Bill Cunningham, MSC
Aerospace Physiologist

Aerospace Psychologist's Section

BEHAVIORAL PROBLEMS AND THE AVIATION MISHAP

Although careful screening assures that occurrences of mental disorders among naval aviation personnel are rare, occasionally a flight surgeon may deem it necessary to obtain psychiatric evaluation of persons involved in naval aviation accidents or incidents. These evaluations give us insight into the personality dynamics of the individuals involved. An excerpt from a Medical Officer's Report received at the Naval Safety Center recently is presented here.

Burned Up

A third class petty officer, intoxicated while on duty, willfully set fire to an aircraft thinking, as he lit the match, "This will really p... them (his superiors) off."

It was the opinion of the psychiatric examiner that although this individual was free from mental disease or disorder, he exhibited a severe emotionally unstable personality, as manifested by recurrent drinking, impulsive actions, poor delay of gratification and control of behavior, and that he was unsuitable for further U.S. Naval Service. The psychiatrist made the following comments in his report: There was evidence of a long standing unexpressed rage at his father. Prior to entry into the service he had spent six months in a reform school after participating in 13 automobile thefts while he was 15 and 16 years of age. He was expelled from school for smoking and fighting in the 10th and 11th grades. His family life was not conducive to stability and he had engaged in impulsive actions all his life.

The flight surgeon stated in his MOR, "It would be unfair to state categorically that this incident could have been foreseen in any definite behavior pattern. However, it does point out strongly the need for supervisory personnel to know their men thoroughly and to be constantly perceptive of immediate circumstances which determine and influence behavior.

(Continued)

Burned Up (Continued)

In a working relationship one tends to evaluate a person solely by his performance on the job and complacency is relinquished only when the machine fails to function. There are many factors which determine performance and these are often taken for granted, namely physical capability, mood, personality type, natural ability, etc.

"It is therefore the recommendation of the flight surgeon that all supervisory personnel know their men thoroughly present data as well as basic background information, and that this be subject to periodic testing. With this thorough knowledge they will be better equipped to evaluate the individual in relation to his capability and the job to be done. It is also imperative that supervisory personnel remain alert and perceptive to the immediate circumstances concerning both the men and the job."

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PREDISPOSITION TOWARD ACCIDENTS

In an addendum to a recent MOR, LT D.P. Cantwell, MC, a Navy psychiatrist, had the following comments to make.

"Concerning possible accident-proneness, the patient does give a history of several incidents involving airplanes; however, a high incident of incidents or accidents does not in itself justify a diagnosis of accident-proneness. A number of valid research studies indicate that people are more susceptible to accidents a) when they have been drinking, b) when they have been taking tranquilizers or sedative drugs, c) when they are suffering from extreme fatigue. None of these conditions would seem to have applied in any of this pilot's incidents or accidents. However, the ability to avoid accidents does depend on a number of complex psychological and physiological processes: The individual must maintain an attitude of constant alertness to the external world, and ability to evaluate possible risk situations, together with the capacity to act quickly and intelligently to avoid them, and finally, the wish, conscious, or unconscious, to avoid such situations. Anything that interferes with any of these processes even temporarily will increase the individual's accident susceptibility. Thus, such physiological influences as fatigue, illness, alcohol and sedative drugs do impair a person's efficiency and consequently will increase the likelihood of his having an accident. Emotional influences may have a similar effect whenever a person is temporarily tense and angry,

(Continued)

Predisposition Toward Accidents (Continued)

unusually elated or preoccupied with his worries and his alertness to potential risk situations and his capacity to deal with them effectively are impaired. Furthermore, some clinical studies indicate that some people may even fail to care about danger and in some instances may even court danger."

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Abstracted by Robert A. Alkov, PhD

NAVAL SAFETY CENTER
NAVAL AIR STATION
NORFOLK, VIRGINIA 23511

19 May 1969

MEMO TO FLIGHT SURGEONS

Due to the increase of discrepancies noted in recently submitted MOR's your attention is again directed to the following:

1. Abbreviated MOR's (OPNAV FORM 3750/8J) are being submitted without FORM 8A.

a. OPNAV NOTICE 3750 of 3 March 1969 states in paragraph 3.a. "when an MOR is required the standard OPNAV FORM 3750/8A will always be completed for each mishap. These basic data covering identification, flight data and a narrative account of the mishap are required for cross reference and accident analysis."

b. Flight Surgeon's Newsletter - 2nd Quarter 1969 states on page 7: "Note that FORM 8J for each qualified individual must accompany 8A which is submitted for each mishap."

c. Abbreviated MOR's, (FORM 8J) not accompanied by FORM 8A cannot be processed and will be returned to originator for resubmission in accordance with instructions.

2. Smeared illegible copies of MOR's which cannot be reproduced for further distribution are still being submitted. They will be returned in the future and resubmission required.

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